TAB I

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers	)	CC Docket No. 01-338
	)	
Implementation of the Local Competition Provisions of the Telecommunications Act of 1996	)	CC Docket No. 96-98
	)	
Deployment of Wireline Services Offering Advanced Telecommunications Capability	)	CC Docket No. 98-147

REPLY DECLARATION OF ROBERT D. WILLIG

I. QUALIFICATIONS.

1. I am Professor of Economics and Public Affairs at the Woodrow Wilson School and the Economics Department of Princeton University, a position I have held since 1978. Before that, I was Supervisor in the Economics Research Department of Bell Laboratories. My teaching and research have specialized in the fields of industrial organization, government-business relations, and welfare theory.

2. I served as Deputy Assistant Attorney General of Economics in the Antitrust Division of the Department of Justice from 1989 to 1991. I am the author of *Welfare Analysis of Policies Affecting Prices and Products*; *Contestable Markets and the Theory of Industry Structure* (with W. Baumol and J. Panzar), and numerous articles, including "Merger Analysis, IO theory, and Merger Guidelines." I am also a co-editor of *The Handbook of Industrial Organization*, and have served on the editorial boards of the *American*

Economic Review, the *Journal of Industrial Economics* and the MIT Press Series on regulation. I am an elected Fellow of the Econometric Society and an associate of The Center for International Studies.

3. I have been active in both theoretical and applied analysis of telecommunications issues. Since leaving Bell Laboratories, I have been a consultant to AT&T, Bell Atlantic, Telstra and New Zealand Telecom, and have testified before the U.S. Congress, this Commission, and the public utility commissions of about a dozen states. I have been on government and privately-supported missions involving telecommunications throughout South America, Canada, Europe, and Asia. I have written and testified on such subjects within telecommunications as the scope of competition, end-user service pricing and costing, unbundled access arrangements and pricing, the design of regulation and methodologies for assessing what activities should be subject to regulation, directory services, bypass arrangements, and network externalities and universal service. On other issues, I have worked as a consultant with the FTC, the Organization for Economic Cooperation and Development, the Inter-American Development Bank, the World Bank and various private clients. I also served on the Defense Science Board task force on the antitrust aspects of defense industry consolidation and on the Governor of New Jersey's task force on the market pricing of electricity.

II. INTRODUCTION AND SUMMARY OF CONCLUSIONS.

4. I have been asked to provide an economic analysis of the D.C. Circuit's decision in *USTA v. FCC*, 290 F.3d 415 (D.C. Cir. 2002), which remanded the Commission's *UNE Remand Order*, 15 FCC Rcd. 3696 (1999) and *Line Sharing Order*, 14 FCC Rcd. 20912 (1999). In particular, I have been asked to address the four specific instances where the

Commission's reasoning in the *UNE Remand Order* and *Line Sharing Order* was found to be inadequate and, therefore, required further analysis by the Commission. First, the Court found that in determining whether a CLEC was at a material cost disadvantage relative to the ILEC in self-deploying a particular network element, the Commission impermissibly considered "universal" cost disadvantages, rather than limiting its consideration to cost disadvantages "linked" to the "natural monopoly" characteristics of the local exchange network. *USTA*, 290 F.3d at 427. Second, the Court found that the Commission had failed adequately to explain its decision to adopt "national unbundling rules" because it had not responded to the claims of the incumbent local exchange carriers ("ILECs") that section 251(c)'s "impairment" standard must account for the existence of above- and below-cost retail rates. *Id.* at 422-26. Third, the Court also found that in promulgating national unbundling rules the Commission had failed to demonstrate that "broad" access to unbundled network elements ("UNEs") did not sap the incentives of either competitive carriers ("CLECs") or ILECs to invest in network facilities. *Id.* at 423-34. Finally, the Court faulted the Commission for unbundling the high frequency portion of the loop without considering the impact of "intermodal" competition. *Id.* at 428-29.

5. In each of these instances, I believe that the explanation found lacking in the Commission's prior orders by the Court can easily be supplied, and that the Commission's prior determinations to unbundle loop, transmission and switching facilities on a national basis are supported by sound economics and should be re-affirmed. In contrast, I conclude that if the Commission were to reverse course on any of these issues, it would be contrary to the public interest.

6. *Relevant Cost Considerations.* The assembled record provides ample support for finding that CLECs are impaired without access to loops, transport and switching facilities for reasons that are "linked" to the "natural monopoly" characteristics of local exchange networks. *See infra* Part III. With regard to transmission facilities, I demonstrate that these elements fit the classic definition of natural monopoly – *i.e.*, they enjoy substantial economies of scale over the full range of demand. Moreover, the ILECs' dominant position is protected by entry barriers that arise from the coupling of these economies of scale with the need of a new entrant to invest in considerable sunk facilities, and that consequently would require CLECs to incur substantial costs and risks that the ILECs did not have to bear.

7. Although switching is not characterized by the same level of scale economies and sunk investment as transmission facilities, CLECs are impaired without access to unbundled switching to serve voice-grade loops for reasons that are also "linked" to natural monopoly. That is because ILECs' switches are *physically* "linked" to their bottleneck local loops. Thus, whenever a CLEC wants to serve a customer with its own switch, it must arrange to have the ILEC break the existing "hardwired" connection between the ILEC's switch and customer's loop, and re-establish a connection between the CLEC's switch and the customer's loop. Existing manual hot cut processes provide CLECs with patently inferior access to voice-grade loops and prevent them from providing services of equal quality to ILECs. Until this process is replaced with some effective form of electronic loop access provisioning, CLECs will be impaired without access to unbundled switching to serve voice-grade loops. And the additional costs CLECs must incur to

extend customers' loops to their own switches also contribute to impairment since they constitute expenses that ILECs do not have to bear.

8. *Existence Of Cross-Subsidies.* It would be contrary to sound public policy for the Commission to attempt to account in its impairment analysis for the "advantages" that CLECs have by virtue of being free of the duty to provide ubiquitous service, because such an inquiry presents additional complications of its own. *See infra* Part IV. This would require the Commission effectively to undertake a rate case for each and every CLEC. The Commission would need to determine (1) the types and numbers of customers that each CLEC would serve, (2) the costs that would be incurred in serving these customers through self-provisioned CLEC facilities, (3) the retail rates that the CLEC would be able to charge, (4) the overall revenues that it would realize from the entirety of its customer base, and (5) the margins it would be able to achieve (which would be enhanced to the extent that the CLEC would be able to avoid serving customers who do not generate sufficient revenues to cover the costs of serving them). This is simply not administratively feasible.

9. It is also not necessary because the existence of cross-subsidies is simply irrelevant to the type of impairment showing made by AT&T and other CLECs. These carriers demonstrate that they are unable to self-provide network facilities even when they target the class of customers that are putatively being charged above-cost rates. If CLECs cannot profitably replicate ILEC facilities to serve this discrete class of customers, then, by definition, CLECs are also impaired in serving customers that are being charged rates that are at or below cost. And to the extent the Commission orders unbundling of

network elements to serve customers for whom retail rates are well below cost and for whom competition may simply not be possible, it is truly a case of "no harm, no foul."

10. *ILEC And CLEC Investment Incentives.* There is now substantial evidence demonstrating that unbundling does not sap either the investment incentives of CLECs or ILECs. *See infra* Part V. As I explained in my Initial Declaration in this proceeding, CLECs have strong reasons to invest in their own facilities – even when ILEC facilities can be leased more cheaply – because CLECs are understandably reluctant to be dependent upon a supplier of critical inputs that has no incentive to supply those inputs in a commercially reasonable manner. Further, UNEs serve as a "bridge" that allows competitive carriers to overcome partially the sunk cost entry barriers into local telephone markets. In other words, as the *USTA* Court recognized, UNEs can allow a new entrant to build a customer base and then transition that base to its own facilities once it is economic to do so. *USTA*, 290 F.3d at 424 ("[A]ccess to UNEs may enable a CLEC to enter the market gradually, building a customer base up to the level where its own investment would be profitable.").

11. I also explained that ILEC investment incentives are not materially weakened by unbundling. At bottom, as the ILECs' ultimately acknowledge, their complaint is not against unbundling *per se* but agaainst the prices that they may charge for UNEs. However, appropriate UNE rates set under the TELRIC principles ensure that ILECs have adequate incentive to invest in new facilities because such rates include a forward-looking, risk adjusted cost of capital and depreciation lives – a point that the Supreme Court has expressly recognized. *See Verizon Communications Inc. v. FCC*, 122 S. Ct. 1646, 1677 (2002) ("TELRIC itself prescribes not fixed percentage rate as risk-adjusted capital costs and recognizes no particular useful life as a basis for calculating

depreciation costs" and, therefore, may be "adjusted upward if the incumbents demonstrate the need"); *id.* at 1678 ("TELRIC rates leave plenty of room for differences in the appropriate depreciation rates and risk-adjusted capital costs depending on the nature and technology of the specific element to be priced."). Competition fostered by the Telecommunications Act of 1996 ("the Act") also gives ILECs added incentive to improve their networks in order to avoid losing customers to new entrants. *Verizon*, 122 S. Ct. at 1676 n.33 (it is "commonsense . . . that so long as TELRIC brings about some competition, the incumbents will continue to have incentives to invest and improve their services to hold on to their existing customer base").

12. In all events, the "multiple regression analyses" that *USTA* said were not "*ipso facto*" required to support the Commission's analysis, *USTA*, 290 F.3d at 425, are, in fact, available and demonstrate that the ILECs' claims are baseless. In my Initial Declaration, using both "reduced form" and "structural form" econometric relationships, I showed that the ILECs' claim that relatively low UNE-P prices stifle ILEC investment must be rejected. Those econometric results also provided support for the contrary conclusion – *i.e.*, that easing CLEC entry with relatively low UNE-P prices actually *encourages* ILEC investment.

13. In this declaration, I confirm those conclusions using an expanded data set. The econometric results now provide fully statistically significant support for the hypothesis that easing CLEC entry with lower UNE-P prices encourages ILEC investment. At the same time, the econometrics establish at better than the standard 5% level of statistical significance the rejection of the contrary hypothesis advanced by the ILECs that easing CLEC entry with lower UNE-P prices discourages ILEC investment.

14. In addition, Dr. Richard N. Clarke, in his accompanying Reply Declaration, has undertaken a regression analysis of AT&T's investment in facilities as a function of the availability of UNEs. Dr. Clarke finds that the availability of UNEs *enhances* AT&T's incentives to invest in its own facilities.

15. *Intermodal Competition.* Finally, existing and foreseeable levels of "intermodal" competition are not grounds for denying CLECs access to UNEs, particularly local loops. *See infra* Part VI. The Supreme Court required the Commission to consider whether substitute services that are offered outside the ILECs network have led to the profitable provision of service by multiple providers that is the object of the Act. *Iowa Utils. Bd. v. FCC*, 525 U.S. 366 (1999) ("impairment" requires the Commission to consider the "availability of elements outside incumbent telephone local exchange carrier's (LEC) network"). As explained below, there is little or no such profitable provision of local service by multiple providers.

16. That is plainly the case for the voice services. The competition that is provided by cable telephony is extremely limited in scope. Further, even if it were to develop appreciably, it would permit, at most, a duopoly. As the Commission explained in its *UNE Remand Order* (¶ 55), the language and history of the 1996 Act make it explicit that Congress rejected any notion that voice competition from cable television operators could afford grounds to do away with the Act's unbundling requirements.

17. That proposition is equally true for broadband services. Again, cable services are today the only viable competition to ILEC DSL-based services and these services are not always available where DSL is available. And to date, intermodal competition has not been sufficient to constrain the ILECs from acting on their strong incentives to charge

high DSL rates. After the contraction of "data LECs" last year, the ILECs substantially raised prices and continue to publicly state that DSL prices remain "too low."

III. THE "COST DISPARITIES" THAT *USTA* IDENTIFIED INCLUDE ALL ADVANTAGES "LINKED" TO THE NATURAL MONOPOLY CHARACTER OF THE INCUMBENTS' FACILITIES AND ALL RELATED ENTRY BARRIERS, AND THESE ADVANTAGES ESTABLISH THAT CLECS ARE IMPAIRED IN PROVIDING SERVICE IF LOOPS, SWITCHES, AND TRANSPORT ARE NOT AVAILABLE.

18. As noted, the court of appeals faulted the Commission for considering too broad a category of cost disparities. In particular, the Court concluded that the Commission should not consider cost disparities that are "universal as between new entrants and incumbents in *any* industry," "no matter how competitive." *USTA*, 290 F.3d at 426-27 (emphasis in original). The Court stated that "[a] cost disparity approach that links 'impairment' to universal characteristics, rather than ones linked (in some degree) to natural monopoly," fails to strike the proper "balance." *Id.* Responding to the D.C. Circuit's different analysis presents no difficulty on the facts presented here. Although the *UNE Remand Order* did rely upon some examples of cost disparities that might be deemed "universal," such as the portion of the switching discussion cited by the Court of Appeals, *see USTA*, 290 F.3d at 427, there are many other sources of cost impairments that are not "universal" but rather specific to the ILECs' historic monopolies in the local telephone markets and that fully demonstrate the CLECs' need for unbundled access. In particular, I identify three principal features of these markets that add up to substantial economic entry barriers: scale (and scope) economies, sunk costs, and the first mover advantages of the incumbents.

19. It is key to recognize that ILECs have substantial economies of scale and scope that enable them to provide service at lower per-unit costs than CLECs – a form of cost disparity that the *USTA* court explicitly recognized as a legitimate source of "impairment." *See USTA*, 290 F.3d at 426 ("The classic case where competitor duplication would make no economic sense is where average costs are declining throughout the range of the relevant market."). As I explain in greater detail below, transmission facilities have declining costs through all relevant levels of demand and, as a result, ILECs have significantly lower costs than all new entrants. Under accepted economic definitions, this establishes that transmission facilities are natural monopolies. *See* John C. Panzar, *Technological Determinants of Firm and Industry Structure*, in HANDBOOK OF INDUSTRIAL ORGANIZATION, vol. 1, R. Schmalensee and R.D. Willig, eds. North-Holland, 1989, at 3-59., and Ronald R. Braeutigam, *Optimal Policies for Natural Monopolies*, in *ibid.*, vol. 2, at 1289-1346. On the other hand, switches, which have less pronounced scale economies on their own, are usually "hard wired" to natural monopoly loops, making CLEC access to such loops uneconomic for certain classes of customers, particularly those in low volume locations that cannot economically be served except through the use of voice-grade loops.

20. But just as important, and essential to recognize, is the fact that the costs of many telecommunications facilities are sunk. An investment is sunk if, once made, it cannot be re-deployed for some other use. *See UNE Remand Order* ¶ 75. It is basic economics that the need to incur significant sunk costs to deploy facilities that have substantial scale economies establishes a significant entry barrier.

21. The reasoning for this is straightforward. If costs are sunk, the potential entrant knows that it will not be able to recover its costs if it is unable to attract sufficient revenues to recover the sunk costs. At the same time, because of economies of scale, the new entrant will incur higher per-unit costs, making it difficult for it to win sufficient customers away from the incumbent. Further, because the incumbent has already sunk its costs and has very low marginal costs, there is a significant threat that the incumbent could drop its prices in response to competitive inroads at any time down to its short run costs.

22. It is for these reasons that there is broad agreement in the economics community that industries characterized *both* by declining average costs *and* sunk costs are natural monopolies protected by economic entry barriers. For example, see William J. Baumol, John C. Panzar, and Robert D. Willig, CONTESTABLE MARKETS AND INDUSTRY STRUCTURE (Harcourt Brace Jovanovich, Inc., 1982) and Dennis W. Carlton and Jeffrey M. Perloff, MODERN INDUSTRIAL ORGANIZATION (3rd Ed. Addison Wesley, 2000). Thus, even if an entrant could reasonably approximate the scale economies of the incumbent, the existence of sunk costs and the threat that the incumbent would respond with rock-bottom prices means that potential competitors will choose not to enter. In such circumstances, construction of competitive facilities can truly be "wasteful," because entry can result in investments in assets that ultimately cannot be used for any purpose.

23. The fact that there has been some self-supply of transmission facilities to date does not disprove this analysis. First, as I discussed above and in my Initial Declaration, much of this investment was, in fact, wasteful because new entrants were not able to achieve revenues sufficient to cover their costs. *See* Willig Dec. ¶¶ 90-97 & Table 2.

24. Second, in some circumstances, an ILEC might choose to maintain existing supra-competitive rates and not respond to competitive entry. If entry is limited and not broad-based, an ILEC may find it more profitable to keep the existing price umbrella that allows it to charge generally high rates while losing a small number of customers to the new entrant, rather than to bring prices down across-the-board to keep CLECs from making competitive inroads.

25. Reliance on the existence of this pricing umbrella, however, is very risky. To the extent that an ILEC can price discriminate, it will be able to lower prices selectively, only to those customers that could potentially be served by the new entrant and keep prices high for all other customers. For example, if a competitive carrier were to deploy transport facilities between two points, an ILEC could respond by lowering prices on that route but not any others. Also, the price umbrella could be collapsed by the possible future entry of *other* CLECs. Thus, even if a CLEC can be reasonably sure that prices will remain stable in the near term after entry, to be successful over the long term, it must enter at costs comparable to the ILEC's because there remains a significant risk that the ILEC will ultimately choose to lower its prices down towards its costs.

26. Third, new entrants can partially overcome sunk cost entry barriers to the extent that they are able to sign customers up with long-term contracts in advance of their commitment to sink investment capital. This gives the new entrant carrier reasonable assurance that it will be able to earn sufficient revenues to recover the costs of its sunk investment. Although I understand that competitive carriers seek to gain customers in this fashion, I also understand that in reality it is quite difficult. Few customers are willing to sign up

for service and then wait extended periods of time for the carrier to build the facilities necessary to provide the service. AT&T Initial Comments at 126-28.

27. As the *USTA* Court recognized, UNEs can help to mitigate – but not eliminate – the sunk cost barrier to entry. CLECs can use UNEs to gain a sufficient customer base to justify the deployment of some facilities, and then switch those customers over to its own facilities. *See USTA*, 290 F.3d at 424 ("[A]ccess to UNEs may enable a CLEC to enter the market gradually, building up a customer base up to the level where its own investment would be profitable."). Indeed, as explained above, AT&T has used UNE-P to build up a customer base in certain areas and then, if it is technically and economically feasible, move customers to a UNE-L arrangement so that it can serve those customers with its own switches.

28. Likewise, CLECs can use UNE loops and transport to win a customer to solve the "chicken and egg" problem of having to win a customer and then build facilities to serve that customer. By using UNEs, CLECs can provide service immediately under a long-term contract and then construct the necessary transmission facilities to serve that customer, switching the customer over to the self-provided facilities when they are finally deployed (assuming the customer is willing to permit such a transition). In this way, the new entrant does not have to sink its costs until it has a reasonable expectation that it will have the traffic necessary to recover its costs.

29. Finally, the ILECs separately enjoy enormous "first mover" advantages. This creates a substantial entry barrier in the classic sense, for CLECs must bear costs that the ILECs did not. George J. Stigler, THE ORGANIZATION OF INDUSTRY 67 (1968) (an entry barrier is "a cost of producing (at some or every rate of output) which must be borne by a firm

which seeks to enter an industry but is not borne by firms already in the industry"); *see also Bell Atlantic-NYNEX Merger Order*, 12 FCC Rcd. 19985, ¶ 129 n.247 (1997) (same). These first mover advantages of the ILECs are not "universal" or even widely experienced in other sectors of the economy, but instead are a function of specific features of telecommunications markets – the need for broad access rights to public streets and customer locations.

30. For example, as first movers, ILECs received rights-of-way from local governments for underground cables and telephone poles and wires with only minimal transaction costs, because persons in the neighborhood or municipality otherwise would not receive *any* telecommunications services. Similarly, building owners and landlords welcomed and accommodated ILECs that promised to bring, for the first time, telecommunications facilities to their properties.

31. But subsequent entrants do not have these advantages, since they are not the first movers. CLECs often incur substantial transactional costs – in some cases, discriminatory higher charges – as well as delays in getting access to rights-of-way and associated construction permits, as local governments balance any negative impacts of new rights-of-way applications (such as in the form of disruption of traffic) with the benefits not of initial telecommunications service, but of simply additional competition. CLECs must also negotiate building access on a building-by-building basis, and are often faced with building owners who may see little additional value to their buildings from a second or third service provider. Further, whereas ILECs entered markets with no competitors and today, as a result, have facilities in place to serve all customers, CLECs must often

commit to deployments based on projections or speculation that there will be demand for such facilities.

32. I understand that the ILECs have argued that impairment should not be found based on considerations of timeliness and delay. They contend that "CLECs had more than 5 years in which to deploy and/or make arrangements with alternative sources." Qwest at 14 n.22; *see also* Verizon at 58-59. This argument makes little sense.

33. As a matter of basic economics, delay is not a one-time phenomenon that occurs only when a CLEC first decides to enter a market. Rather, as the Commission has correctly recognized, the problem of delay exists not only with respect to the "start-up time required for a competitor to enter a market," but also with respect to "the time it would take a competitor that has already entered the market to expand its operations to serve more customers." *UNE Remand Order* ¶ 89. Thus, even those carriers that have already entered "must be able to initiate service promptly upon the request of their customers" "in order to compete effectively." *Id.* ¶ 93. For example, absent the availability of UNEs, CLECs have virtually no ability to self-deploy loops because customers simply are unwilling to order service and then wait months for the CLEC to build the loop.

34. For these reasons, the kinds of delays that CLECs suffer due to inability to obtain rights-of-way and building access – but ILECs, because of their first mover advantage, do not – continue to impair CLECs seeking to serve new customers regardless of how long they have been in the market.

35. Another first mover advantage that the ILECs enjoy is the CLECs' need to incur substantial "switching costs" that the ILECs do not have to bear. Unlike the ILECs that

started with no competition, CLECs must spend significant sums to market their services, develop a brand and convince consumers to switch from their incumbent provider, and to "overcome" the relationships that the ILEC has.[1] *UNE Remand Order* ¶ 87. This is particularly a formidable challenge given the importance most consumers and businesses place on telecommunications services and their unwillingness to risk service interruptions. CLECs will thus need to spend much more per customer on marketing efforts to win customers away from incumbent LECs, and will generally also have to underprice the ILEC to obtain business. *UNE Remand Order* ¶ 87. *See also First Video Competition Report*, 9 FCC Rcd. 7442, ¶¶ 39-40 (1994) ("[E]ntrants must entice customers with a lower price and/or incur a greater selling expense per unit than the incumbent(s). . . . As a result, . . . an entrant must incur promotional expenditures to overcome the incumbent's existing market dominance. Such expenditures are unrecoverable by the entrant in the event of market exit and may constitute, therefore, a sunk cost impediment to entry.").

36. Economies of scale, sunk costs and first mover ILEC advantages clearly exist for loops and transport facilities. And while scale economies and sunk costs are somewhat less pronounced in the case of switching viewed separately, switches are physically "linked" to natural monopoly loops and, therefore, in the absence of seamless access to loops,

[1] Even in the case where a CLEC has a longstanding relationship with the customer (*e.g.*, because the CLEC has been the customer's long distance provider), this relationship needs to be extended to local services. Moreover, many commercial customers may be under long-term contracts with termination penalties that further increase a CLEC's costs of competing for their business.

competitive carriers are impaired in their ability to self-provide switching, at least for customers served by voice-grade loops. *See* Brenner Dec. ¶¶ 2-10.

37. *Loops*. Alternatives to ILEC-provided local loops can exist only in exceptional circumstances. These structures entail very large fixed costs because, in order to serve a particular neighborhood, poles must be placed or trenches must be dug regardless of the number of subscribers in that neighborhood. The costs of loops are effectively sunk, because they cannot be redeployed elsewhere. Because ILEC loops have massive fixed, sunk investment and very low marginal costs, they enjoy strong natural monopoly characteristics. *See* Clarke Dec. ¶¶ 30, 33 (documenting scale economies of loops). Under these circumstances, unit costs decrease as the number of subscribers increases or as the distance to reach each subscriber or group of subscribers decreases. ILECs currently serve virtually all subscribers attached to their loop plant, and thus have a relatively large number of subscribers over which their fixed loop plant costs are spread. It is thus exceedingly difficult, if not impossible, for new entrants profitably to overbuild the existing telephone network, because a new entrant typically has very few customers, at least initially, from which the same fixed costs may be recovered. The difficulties that the CLECs face are magnified by the fact that the ILECs typically build their networks with excess capacity (*i.e.*, dark fiber) that can be lit for little additional cost.

38. Given these economics, the deployment of alternative loops is thinkable only in the case of a high capacity loop used to serve concentrated demand existing at small numbers of locations that are in close proximity to deployed fiber transport facilities. But even as to these customers, ILECs here also enjoy first mover advantages – the receipt of automatic rights-of-way, building access, and connections to all customers – that mean that, as a

practical matter, CLECs will be able to construct and deploy high capacity loops in dense areas only in exceptional circumstances.

39. CLECs also suffer from a classic "chicken and egg" dilemma discussed above when deploying loops, as discussed above. When a customer orders service, the customer is rarely willing to wait while the CLEC builds loop facilities. No carrier, even AT&T, can rationally build sunk loop facilities merely on the hope that traffic will materialize on that point-to-point route. Thus, the Commission correctly concluded that "it would be unreasonable to expect a competitive LEC to invest the large sums of capital needed to build out ubiquitous loop plant" "including the costs of fiber, the costs of deploying fiber in public rights-of-way, trenching and the costs of purchasing and collocating the necessary transmission equipment" "before the competitive LEC has established a substantial and secure customer base." *UNE Remand Order* ¶ 183.

40. *Transport.* Transport facilities likewise share these same natural monopoly characteristics. Like loops, transport consists of point-to-point cables supported by poles or buried in trenches or pulled through buried conduit. Thus, like loops, transport facilities have enormous fixed and sunk costs and large economies of scale. Also, with transport facilities, just as with loops, structure costs vary directly with distance; the greater the distance to be covered, the more poles or feet of trench or feet of conduit are required. Thus, for any given amount of traffic, the cost per unit of traffic will be lower where large amounts of traffic can be aggregated and carried a short distance than in areas where smaller amounts of traffic must be carried for longer distances.

41. Again, this theoretical analysis is confirmed by Dr. Clarke. Even a CLEC that were to secure a 30% market share would have per-line transport costs that would exceed the

incumbent's by 178%. Clarke Dec. ¶ 30. And that is assuming that the CLEC were able to secure the hypothesized 30% share throughout the entire region. If one assumes more realistically that the CLEC "targets" its entry into specific regions of a state, the transport cost disadvantage that the CLEC would face would grow even more dramatically. *Id.* ¶ 33.

42. First mover advantages are also a determinant of major entry barriers in this context. Because they were granted monopoly franchises that shielded them from competition, ILECs have a vast network of high speed transport facilities connecting their local switches.[2] This provides the ILECs with a number of cost advantages that will not be available to new entrants. Beyond having enormous volumes of traffic that can justify the highest bandwidth (and therefore, lowest cost) fiber optic facility, a large proportion of ILEC traffic in the local exchange network originates and terminates within the same central office. This intra-office traffic need not be transported at all. Intra-office traffic is, for this reason, less costly than interoffice traffic. For the CLEC, which will not initially have switches in each wire center, *all* traffic must be transported, even traffic originating and terminating in the same wire center, and thus will be more costly. In constructing its network, therefore, the CLEC must size its transport facilities to carry all traffic while the ILEC need only size its network for its interoffice traffic. Further, ILECs have both interoffice facilities and loop facilities throughout the local exchange area. As a result, a portion of the structure costs of interoffice facilities and loop facilities

[2] The ILECs have deployed a ubiquitous transport network of 362,000 miles of fiber that connects over 14,000 LSOs. *Universal Service Monitoring Report*, Tables 10.1 & 10.2 (October 2001).

may be shared, thus somewhat reducing the unit costs of structure for both loops and transport. This opportunity for cost savings would not initially be available to the CLEC, and may not be available at all unless the CLEC can also profitably overbuild the incumbent's loop facilities.

43. Lastly, like loop plant, discriminatory access to rights-of-way creates a barrier to self-deployment of transport facilities for CLECs. CLECs have met with significant resistance from municipalities in attempting to secure the necessary rights-of-way to deploy transport facilities. AT&T Initial Comments at 141-44. Under the best of circumstances, these rights-of-way take several months and in some instances, years, to develop. Also, many municipalities have attempted to impose discriminatory fees on CLECs (or prohibited new construction altogether).

44. *Switching.* Although the Court appeared to suggest that switches lack economies of scale, that is not the case. *See USTA*, 290 F.3d at 427. The available data demonstrate that fixed costs are a very large portion of the cost of the switch, and costs decline over the range of demand. In addition to the cost of the switch itself, several items that support the switch also have significant costs that do not predominantly vary with volume. These include the cost of the building that houses the switch, the cost of power and air conditioning, and certain test equipment. The basic cost of software used to operate the switch also does not vary with usage, and this can be a significant and recurring cost over the life of the switch. For all these reasons, the Commission found that switching is characterized by not insignificant scale economies that give CLECs material cost disadvantages. *UNE Remand Order* ¶ 260. This is consistent with the empirical work reported by Dr. Clarke in his initial declaration from which he finds that

even CLECs that obtain a sizeable market share are still at a significant cost disadvantage compared to ILECs. Clarke Dec. ¶¶ 30, 33.

45. Nonetheless, despite the existence of some scale economies, it is reasonable to expect that new entrants theoretically have the potential ability to self-deploy switching to serve some customers. Unlike transmission facilities, not all the costs of a switch are sunk. In contrast to transmission facilities, a switch can be moved and re-deployed to another location (albeit, at a cost penalty).

46. The ability of CLECs to self-deploy and use their own switches, however, has been severely limited because of the architecture the ILECs universally employ to connect switches to loops. ILECs' exchanges were designed by monopolists that operated in a single-carrier environment and have been arranged so that the ILECs' switches are "hardwired" to the loops that themselves have natural monopoly characteristics and cannot be duplicated by the typical CLEC. Thus, in order for a CLEC to use a self-deployed switch, a "hot cut" must be provided that takes the loop off of the ILEC's switch and directs it toward the CLEC's switch. The existing hot cut processes, however, have proven unworkable and CLECs have not been able to gain access to voice-grade loops at quality and costs comparable to the ILECs. AT&T Initial Comments 214-17; Brenner Dec. ¶¶ 39-41, 66-73. This problem exists not only for ordinary copper loops, but also for DLC loops. In fact, the technical problems in providing hot cuts for the steadily growing number of DLC loops can be even more severe than for ordinary copper loops. As a result, CLECs will not be able to gain nondiscriminatory access to voice-grade loops until some form of electronic loop provisioning is implemented that replaces

the existing hard-wired loop-switch connection with a virtual circuit. *See generally* Gerszberg Dec.

47. Further, CLECs experience other delays and costs in using self-deployed switches that are related to the natural monopoly characteristics of ILEC networks. ILEC central offices were designed to accommodate only a single circuit switch. Thus, absent loop-transport UNEs without use and co-mingling restrictions, CLECs must collocate in every central office where they want to gain access to loops. Further, because CLECs have a much smaller customer base than ILECs, they must serve a much larger geographic area than the ILECs in order to fill their switches up with traffic and potentially achieve scale economies comparable in that respect to the ILEC. This means that CLECs must also incur substantial, distance sensitive, "backhaul" costs. In contrast to the collocation and backhaul costs that CLECs must incur, ILECs obtain substitute functions by merely running a short wire across the main distribution frame in the central office.

IV. THE PUTATIVE CONTINUED EXISTENCE OF IMPLICIT SUBSIDIES FOR RURAL AND/OR RESIDENTIAL CUSTOMERS DO NOT WARRANT MODIFICATION OF THE COMMISSION'S NATIONAL UNBUNDLING RULES.

48. The *USTA* opinion stated that the *UNE Remand Order* had not provided a sufficient explanation for its decision to adopt "national unbundling rules" that – with the exception of the carve out for the provision of switching to larger business customers in densest areas of the largest 50 MSA – applied to all geographic areas and customer classes, and meant that UNEs are to be available ubiquitously. *See USTA*, 290 F.3d at 422-26. The Court thought the *UNE Remand Order*'s explanation was inadequate because it failed to address the purported facts that "rural and/or residential customers" are served at below-

cost rates and that incumbents make up the difference by charging above-cost rates to other customers. *Id.* at 422-23.

49. As described in greater detail below, there are three overarching points to be made here. *First*, the question of the extent to which States have in fact required incumbents to provide service to rural and/or residential customers under rates that preclude incumbents from recovering their costs is complicated, and there is no reliable basis for assertions that individual ILECs are incurring "losses" in providing service to any broad classes of customers. *Second*, whatever the true extent of these cross-subsidies, the Commission can readily justify a decision to exclude a review of possible implicit subsidies in making unbundling determinations under the Act, because the prices at which services are currently offered is logically quite *irrelevant* to the question of whether and to what extent unbundling should occur. *Third*, at the end of the day, this is much ado about nothing. The need for unbundling can be proven directly even if current retail prices are assumed and even if the existence of implicit subsidies were relevant. The reason is that actual marketplace experience overwhelmingly demonstrates that, even taking into account any and all advantages that CLECs enjoy because they are not required to serve all customers in the ILECs' service territories, CLECs are today impaired in serving even "above-cost" business customers unless they have rights to access the incumbent's loop, switching, and transport facilities. *A fortiori*, CLECs are also impaired if they cannot access these facilities to serve rural or residential customers. To be sure, there may be areas of the country where rates are well below costs and explicit, portable subsidies are not available because State commissions have not fulfilled their obligations under the

Act.[3] But the fact that competition is simply not feasible in these limited instances should not be a bar to a national unbundling rule. In those instances, a national unbundling rule could not harm ILECs in any way, because no CLEC would ever seek to lease UNEs to serve such customers.

50. **Extent Of Subsidy Provided By Incumbent And Extent Of CLEC "Advantage."** Any determination of the extent to which classes of customers do not generate sufficient revenues to cover the costs of service is complicated, and although it appears that at least some rural residential customers are currently subsidized, there is no reliable basis for any conclusion that ILECs generally serve residential customers at a loss.

51. *Cost Standard.* In order to determine whether there is, in fact, a cross-subsidy, it is necessary to adopt the proper benchmark for determining the costs of providing local telephone service. The Court's opinion suggests that the relevant measure of cost in making this determination is historic cost. *See USTA*, 290 F.3d at 422. That is wrong, and the data that would be required to make a "subsidy" determination under this standard do not currently exist.

52. As the Commission has recognized, the appropriate measure of cost in this context is TELRIC, not embedded costs. TELRIC represents the economic costs that the incumbent incurs when it uses its elements in the provision of its services. *See Local Competition Order* ¶ 679 (TELRIC sets rates "based on costs similar to those incurred by the

[3] However, as noted below, when section 254 is fully implemented, the implicit subsidies that are received by "rural and/or residential customers" will be made explicit and portable, and there will be no customer that any carrier – ILEC or CLEC – is required to serve at a loss, because the difference between the subsidized rates and the carrier's costs will be made up by an explicit subsidy payment that is competitively neutral.

incumbents"). Thus, to the extent that ILECs advocate an impairment analysis based on a comparison of their retail rates with their embedded costs, this analysis is irrelevant. *See Verizon*, 122 S. Ct. at 1672 (costs that exceed TELRIC are inefficient costs).

53. I am also unaware of any data as to the "historic costs" of using existing facilities to provide local telephone services. Indeed, a determination of such costs appears all but impossible. To determine the historic costs of providing service over existing facilities, the Commission would be required to determine the original cost of the facilities, and then calculate, *over the life of the facility*, the appropriate depreciation and rate of return under an historic cost method.

54. *Revenue.* The existence of a cross-subsidy cannot be determined simply by looking at the rate the ILEC can charge for basic local service and comparing that to the costs of service. Rather, *all* the revenues that ILECs earn as a result of providing service to residential customers – including revenues from the full range of *vertical* services (*e.g.*, caller ID, call waiting), revenues from originating and terminating exchange access charges, revenues from second telephone lines, and any long distance (intraLATA toll and interLATA toll) revenues – must be considered. In this respect, the Commission previously found that there is no basis for concluding that residential services are generally subsidized by business services. *See Local Competition Order* ¶ 849.

55. *Subsidy Is Relatively Minimal.* When all sources of revenue are considered, the scope of subsidized services is much narrower than the ILECs have claimed. Indeed, the ILECs themselves have acknowledged that *overall* revenues generated from serving residential customers cover the costs of this service. *See* Direct Testimony of Frank Hatzenbuehler, U S WEST Communications, Inc., *The Investigation and Suspension of Tariff Sheets*

Filed by U S WEST Communications, No. 96S-331T (Colo. PUC Dec. 13, 1996). This is confirmed by the "margin analysis" performed by AT&T in a number of section 271 proceedings.[4] Although AT&T has challenged several section 271 applications on the ground that existing UNE rates are too high for it to offer local services profitably throughout the state, that analysis has also shown that in many instances there are positive profit margins even under existing TELRIC rates, and in AT&T's view, there would be positive residential margins in the densest areas of all states and in all density zones of most states if TELRIC were correctly applied. This is not just AT&T's view. The BOCs have also filed margin analyses in a number of states, including both urban states like New Jersey[5] and relatively rural states like Louisiana[6] and Vermont,[7] that

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[4] In this margin analysis, AT&T calculates whether it can profitably provide service to a customer using UNE-P given existing UNE rates set by the state regulatory commission. In making this determination, AT&T factors in all sources of revenues that can be earned from the services that can be provided over the leased facilities.

[5] *See* Reply Comments of Verizon New Jersey, CC Docket No. 01-347, at 46-48 (filed February 1, 2002) (asserting that "[i]n New Jersey, the gross profit margin available to competitors is substantial" and that those margins are "sufficient to allow competitive entry"); *see also id.* at Tab D ("Reply Declaration of Patrick A. Garzillo and Marsha S. Prosini"), ¶¶ 30-33 (analysis purporting to show that gross margins available to new entrants in new Jersey are sufficient to permit CLEC entry).

[6] *See* Supplemental Brief In Support Of Application By BellSouth For Provision Of In-Region, InterLATA Services In Georgia And Louisiana, CC Docket No. 02-35, at 42-43 (filed February 14, 2002) (asserting that gross margins available to potential new entrants in Lousisana are sufficient to support entry and asserting that "[i]f AT&T is unable to compete [in Louisiana] . . . it should rethink its business plan, for the blame surely lies somewhere other than BellSouth's UNE rates"); *see also id.*, Tab A ("Joint Supplemental Affidavit of John A. Ruscilli and Cynthia K. Cox, ¶¶ 12-25 (purporting to show that "BellSouth's UNE and UNE-P rates in both Georgia and Louisiana offer viable competitors a meaningful opportunity to compete").

[7] *See* Reply Comments of Verizon New England, CC Docket No. 02-7, at 26-31 (filed March 1, 2002) (asserting that margins "[i]n Vermont, the gross profit margin available to competitors is substantial" and that those margins are "sufficient to allow competitive entry"); *see also id.* at (continued . . .)

purport to show that existing UNE rates are sufficient to permit CLECs profitably to offer local services throughout these states.

56. In this regard, the Commission should recognize that the papers cited by the Court do not show that residential services are generally below cost or that cross-subsidies exist in every state. The Crandall and Hazlett article shows only for 10 communities that single-line business rates are higher than residential rates. Robert Crandall and Thomas Hazlett, *Telecommunications Policy Reform in the United States and Canada*, AEI-Brookings Joint Center for Regulatory Studies Working Paper 00-9 (Dec. 2000), at 18 & Table 4. Hazlett and Crandall do *not* claim that the listed residential rates are below cost, but only that the higher business rates are an example of "redistributive politics that drive state regulatory actions." *Id.* at 17. Likewise, in WHO PAYS FOR UNIVERSAL SERVICE?, Crandall and Waverman show that the principal cross-subsidy is from urban residential customers to rural residential customers. *See* Robert Crandall and Leonard Waverman, WHO PAYS FOR UNIVERSAL SERVICE? 107-23 (2000). Further, Crandall and Waverman demonstrate that these cross-subsidies are not uniform, and that in many of the most populous states (including New Jersey, California, Massachusetts, Florida and New York), cross-subsidies are either non-existent or minimal. *Id.* at 121-22.

57. *CLEC Advantage.* Finally, even if one could determine the extent of existing cross-subsidies, calculating the "advantage" that any CLEC has by virtue of being free of a

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(. . . continued)
Tab B ("Reply Declaration of V. Louise McCarren, Patrick A. Garzillo and Michael J. Anglin"), ¶¶ 41-45 (analysis purporting to show that gross margins available to new entrants in new Jersey are sufficient to permit CLEC entry).

duty to provide ubiquitous service presents additional complications of its own. To take the ILECs' argument to its illogical extreme would require not just that impairment determinations be made on a CLEC-by-CLEC basis, but also would require the equivalent of the kind of showing that would be made in rate cases. The extent of any advantage is a function of the territories and classes of customers that the particular individual CLEC seeks to serve.[8] Thus, determinations would have to be made of the types and numbers of customers that each CLEC would serve, the costs that would be incurred in serving these customers through self-provisioned CLEC (or other non-ILEC) facilities, and of the retail rates that the CLEC would be able to charge, the overall revenues that it would realize from the entirety of its customer base, and margins it would be able to achieve (which would be enhanced to the extent that the CLEC would be able to avoid serving customers who do not generate sufficient revenues to cover the costs of serving them). Even if it were possible readily to determine the extent to which incumbents serve particular customers at below-cost prices, quantifying the CLEC "advantage" and making impairment determinations on the basis of them in this fashion would be absurdly burdensome and complicated.

58. **Irrelevance Of Subsidies And Existing Retail Prices To Impairment.** Even if the true extent of cross-subsidies is much broader than I have indicated here, and even if there were an administratively practical way to calculate the magnitude of existing subsidies and the "advantages" CLECs enjoy, there are sound reasons for the Commission to refuse

[8] To the extent the CLEC itself provides ubiquitous service throughout an incumbent's service territories and achieves relatively uniform take rates – as is the case for AT&T in New York and other states – the CLEC has no "advantage."

to take into account the extent of any implicit subsidies when it makes unbundling determinations under the Act, as the ILECs have argued.

59. More specifically, the Court left open the possibility that the Commission could find that CLECs face cost and other disadvantages in self-provisioning facilities that constitute "impairments," whether or not the current pricing of retail services in a state (and an ILEC's duty to serve some customers at non-compensatory rates) gives CLECs offsetting advantages in serving other customers who are currently served at above-cost rates. *USTA*, 290 F.3d at 422-23. The Court noted that the "pure language" meaning of the term "impairment" can permit this result, but believed that the Commission had not sufficiently explained why it should ignore the disadvantages that flow from the ILECs' duty to serve some customers at non-compensatory rates. *Id.* at 423. This explanation is readily provided. There are three reasons why the inquiry that the ILECs suggested would be wholly inappropriate.

60. First, whether or not the Act requires elimination of existing implicit subsidies *after* unbundling occurs, it would have matters exactly backwards and would be entirely antithetical to sound economics and the Act's object of fostering competition if the Commission were to take into account existing levels of retail prices and the extent of any implicit subsidies in making unbundling determinations. The whole point of the competition that unbundling unleashes is to make retail (and exchange access) prices more efficient by driving them closer to cost. Unbundling allows CLECs to undercut prices that ILECs charge to "above-cost" customers and to put pressure on any below-cost rates that are charged any rural or residential customers, ultimately making those implicit subsidies unsustainable. Thus, impairment determinations cannot, if they are to

be economically rational, rest on a static analysis of the CLECs' ability to serve customers through self-provisioned facilities at existing retail prices, but must acknowledge that unbundling unleashes competition that is dynamic and that will drive prices closer to economic cost. Accordingly, any economically sound unbundling determinations must rest solely on the cost and other disadvantages that CLECs have in deploying facilities and using them to provide service, and ignore the existing levels of retail prices for all classes of customers.

61. Although the *UNE Remand Order* did not address the precise point that the D.C. Circuit identified, it did recognize the general irrelevance of retail prices to unbundling determinations and that a finding of non-impairment could not be rationally based on a CLEC's putative ability to provide service through self-provisioned facilities at existing above-cost rates. It noted in Paragraph 73 of that order: "profit margins for both new and existing carriers will depend on the degree of competition that exists in the market." Thus, a CLEC that tried to deploy its own facilities at a cost substantially above the ILEC's costs in order to take advantage of above-cost rates, is quite likely to find its investment stranded as competition forces rates down towards the true economic costs of providing service. As I discussed above, rational entry plans are made on the basis of *post-entry* rates, and an entry strategy based on the assumption that above-cost rates can persist indefinitely is doomed to failure.

62. Second, to take into account – as the ILECs contend that the Commission should – the fact that some States may not yet have implemented section 254 and developed an explicit fund to support legitimate universal service obligations would be peculiarly irrational. As an economist, I believe the Act is best read as requiring unbundling

determinations be made without regard to existing levels of subsidies, because UNE-based competition will put pressure on ILECs, who are in the best position to do so, to seek to have State commissions fulfill their obligation under section 254 to adopt explicit universal service funding mechanisms. Once implemented, such mechanisms fully eliminate the "disadvantage" claimed by the ILECs – *i.e.,* the need "to make up the difference elsewhere" when providing "underpriced service" to certain customers. *USTA*, 290 F.3d at 422-23.

63. Full implementation of section 254 will not only eliminate the putative advantages that CLECs have in serving "above-cost" customers, but it also means that there is no impediment whatever to CLECs serving the customers who are charged subsidized rates. Section 254 requires that existing implicit subsidies be made *explicit* and *portable* – such that the identity of the carrier would be irrelevant in determining who gets the subsidy and such that CLECs would receive the entire amount of the subsidy when they win a rural or other customer in a class that is entitled to receive below-cost subsidized rates. Thus, UNEs should be made available to CLECs to serve areas with even markedly below-cost rates. To the extent the CLEC can provide superior service to the ILEC (whether better quality or lower cost), portable universal service support would allow them to displace the ILEC.

64. Third, for the reasons stated above, the contrary approach suggested by the ILECs is so complex and so administratively burdensome in this setting that this represents an independent ground for rejecting it. Quantifying the current "advantage" that CLECs enjoy by reason of State-imposed retail rate structures would require determining the extent to which ILECs are in fact serving any classes of customers at rates that do not

cover the costs of service – which itself is extremely complicated and depends on data that the Commission does not have. Further, after that determination is made, the ILECs' argument would require the Commission to compare how much it would cost a CLEC to self-provide the facility (or obtain it from a third party) and what revenues it would earn. This in turn would require the Commission not only to determine each and every CLEC's forward-looking costs, but also to estimate each CLEC's volume and types of services provided over the facilities in order to estimate its revenues. In effect, the Commission would have to undertake a mini-rate case for every CLEC before any UNE could be unbundled. The Act clearly did not contemplate such arcane procedures. Indeed, as the Supreme Court held, the Act is intended to "reorganize markets by rendering regulated utilities' markets vulnerable to interlopers, even if that meant swallowing the traditional federal reluctance to intrude into local telephone markets." *Verizon*, 122 S. Ct. at 1661.

65. **CLECs Have Proved Impairment In Serving Above-Cost Customers, Irrespective Of The Extent Of Any Advantages They Enjoy.** Fortunately, there is no reason for the Commission to undertake this exercise because the existence of impairment can be shown directly, even assuming the existence of significant cross-subsidies. In light of the actual market experience of the last three years, CLECs have clearly established that they are impaired in providing service to "above-cost" customers at existing retail rates, notwithstanding any advantages that they may have because they are not obligated to provide ubiquitous service throughout their regions and thus to serve some customers at rates that may be subsidized. Accompanying this Reply Declaration, and my Initial Declaration, AT&T provides sworn evidence demonstrating that CLECs are today unable profitably (or practically) to provide service to all customers served by voice-grade loops

unless they can obtain UNE-P. Indeed, the evidence clearly shows that CLECs massively over-invested in facilities and that CLECs can only efficiently use their own switches to serve the highest volume business customers that purchase DS-1 or greater capacity loops. To the extent that CLECs have been unable to serve profitably many customers that are currently being charged above-cost rates by the ILECs, there can be no conceivable claim that CLECs are not impaired with regard to below-cost customers.

V. NATIONAL UNBUNDLING RULES FULFILL THE ACT'S PRO-COMPETITIVE PURPOSES AND DO NOT SAP ILEC OR CLEC INVESTMENT INCENTIVES.

66. The *USTA* Court also held that the Commission had offered an insufficient explanation for its national unbundling rules in other respects. It thought that the reliance on the administrative burdens of more "granular" rules was insufficient because the Commission had not explained why market-based exceptions could be administered for switching, but not for other elements. *USTA*, 290 F.3d at 423. Thus, the Court asked for more explanation from the Commission regarding the impact of unbundling on investment incentives, just as the Commission did in its *Notice*. Again, it is a simple matter to provide the explanations that the Court requested, for the Commission's prior conclusions are grounded in sound economics given the characteristics of the industry.

67. *Administrability.* The Court found that the Commission had not adequately justified its conclusion that a national list reduced regulation, finding this "counterintuitive." *Id.* at 423. I think it is quite clear that a national list is much more deregulatory than either no list at all or an attempt to impose geographically specific restrictions on the availability of UNEs. Absence of a list would simply push all these same issues to 50 different State commissions, which, I understand, have independent authority to order unbundling.

68. Geographically-based determinations (or other forms of use restrictions) on UNEs also lead to greater regulatory involvement. Indeed, even the supposedly "bright line" three-line switching carve-out has been used for anticompetitive purposes by the ILECs. In particular, several ILECs have claimed that *all* the lines used by a customer at *all* locations within a LATA should be aggregated for purposes of determining the CLEC's entitlement to unbundled switching. *See, e.g.*, AT&T Virginia Section 252 Arbitration Post-Hearing Brief, CC Docket 00-251, Issue III-9 (filed Nov. 16, 2001) (citing and summarizing Verizon testimony). Thus, under this interpretation, a CLEC could not use unbundled switching to serve a business with four locations in a LATA even if *each* of those locations only used a *single* telephone line. To date, the ILECs have even been able to convince State commissions in Florida and Georgia to adopt this reading of the switching carve-out.[9] The record in this proceeding also shows that the Commission's "use" restriction on loop-transport combinations has also led to substantial regulatory litigation and the denial of loop-transport combinations even to CLECs that would use these facilities to provide predominantly local services. *See, e.g.*, AT&T Initial Comments at 103-08.

69. The fundamental point, however, is that any time the Commission draws a "granular" distinction as to what types of customers may be served with a UNE, the ILECs have an

[9] *See* Order No. PSC-01-1402-FOF-TP, *Petition by AT&T Communications of the Southern States, Inc. d/b/a AT&T for Arbitration of Certain Terms and Conditions of a Proposed Agreement with BellSouth Telecommunications, Inc. Pursuant to 47 U.S.C. Section 252*, Docket No. 00731-TP (Fl. PSC June 28, 2001); Order, *Petition of AT&T Communications of the Southern States, Inc. and Teleport Communications of Atlanta, Inc. for Arbitration of Certain Terms and Conditions of Proposed Agreement with BellSouth Telecommunications, Inc. Under the Telecommunications Act of 1996*, Docket No. 11853-U, at 8 (Ga. PSC Apr. 24, 2001).

incentive and ability to advance creative and aggressive interpretations of the line the Commission has drawn, claim that CLECs have not established their eligibility under that interpretation, and force CLECs to litigate their entitlement to UNEs. Moreover, regardless of whether the ILECs' position is incorrect, they may well persuade at least some State commissions or courts before whom the question is litigated to adopt their position (as has been the case with the three-line limit). Indeed, the ILECs understand that, regardless of the ultimate outcome of many of these disputes, the precarious financial condition of their competitors enables them to discourage entry entirely merely by "running out the clock" (or making clear that they will do so).

70. Further, even if the Commission could specify in advance a rule that accurately captured all the "economic" factors that were relevant to the CLECs' ability to self-deploy facilities, there are still numerous real-world "wild cards" that can make it infeasible for a CLEC to deploy a facility even where it might be otherwise economically justified. For example, with regard to loops, there is no way to specify a "generic" rule that in advance can account for i) the customer's willingness and ability to make a multi-year commitment that will apply during the substantial period in which loops are constructed; ii) the availability of the necessary rights-of-way, iii) the time period necessary to construct the facility relative to the willingness of the customer to wait; and iv) whether the CLEC has access to the building. *See* AT&T Initial Comments at 140-48.

71. The same is true for transport. Even if it were possible to specify the capacity levels and other characteristics that might allow alternative transport facilities to be economic on individual routes, rights-of-way and other issues may preclude a CLEC from deploying transport, and doing so will take several years time even after rights-of-ways are secured.

Further, even then, a CLEC may not be able to obtain the necessary collocation arrangements because of lack of space at the central office, excessive up-front or recurring collocation charges, or because the ILEC has imposed other discriminatory terms and conditions on collocation. *See id.*

72. Finally, any economically reasoned switching carve-out must reflect the very real and practical "hot-cut" problem. *Id.* at 214-17; Brenner Dec. ¶¶ 39-41, 66-73. As I discuss below, even if all the other economic factors that prevent the economic use of self-deployed switches, CLECs cannot self-deploy switches to the extent that they must rely on hot cuts. Thus, there can be no across-the-board finding that CLECs are not impaired with regard to switching to the extent that CLECs must rely on manual hot cuts to gain access to customers. Moreover, a CLEC's ability to self-deploy switching depends upon the magnitude of the collocation costs and transport backhaul expenses it incurs. Again, there is no way *ex ante* to specify particular locations where these impairments will not be so large as to prevent deployment of competitive switching.

73. This is not to say that competition will never sufficiently develop for transmission facilities and switching such that one of these elements could be de-listed in at least some situations. But given the nature of the impairments and the economically relevant markets, such competition will develop first in discrete geographic pockets and then spread outwards. Thus, once it is established that competitive supply of a particular element in a particular geographic location is *sustainable*[10] and available at an economic

[10] Experience to date demonstrates why competition must be sustainable. Many competitive carriers deployed facilities only to find out that they did not have sufficient traffic to make (continued . . .)

cost close to the ILEC's cost (*i.e.*, TELRIC) then, and only then, should the Commission begin the process of determining whether (and to what extent) that element could be removed from the national list. It follows too that the scope of any de-listing must be co-extensive with the scope of demonstrated competitive supply. For example, a showing that a handful of point-to-point routes are capable of supporting multiple transport facilities does not support the de-listing of similar transport facilities on any other routes.

74. It would seem to me that, from an institutional perspective, State commissions are in a superior position to the Commission to develop and assess evidence concerning the availability of UNE alternatives in their jurisdictions. The State commissions are already heavily engaged in the day-to-day implementation of the Commission's UNE list through their work in implementing interconnection agreements, reviewing section 271 applications, and regulating ILEC rates. In implementing these responsibilities, State commissions routinely conduct extensive evidentiary proceedings, using discovery, live testimony and cross-examination, to develop and resolve the many specific factual issues that are involved in any impairment analysis. In contrast, I am skeptical that the Commission has the resources to conduct the necessary evidentiary and fact-based impairment analysis in every city and locality in the nation for every UNE, nor does it have the same level of familiarity with, or expertise in, the level of competitive choice that consumers actually enjoy in a particular locale.

(. . . continued)
deployment economic and have since exited the market. Clearly, it would be irrational to de-list a UNE on the basis of facilities deployment that is ultimately not viable.

75. *UNE-P Competition Is Beneficial In Itself.* The Commission can justify the national unbundling rules, irrespective of whether they will lead to the substitution of CLEC facilities for ILEC network elements in all instances. In fact, the Court recognized that this justification would be adequate, but held that the *UNE Remand Order* had not specifically "embrace[d] the idea that . . . completely synthetic competition would fulfil Congress's purposes." *USTA*, 291 F.3d at 424.

76. As I explained in my Initial Declaration, even if purely UNE-based competition never leads to facilities-based competition, such "synthetic" competition furthers the pro-competitive purposes of the Act. Pure "UNE-P" purchasers make substantial investments in support systems and in marketing and related activities that benefit the economy, increase output and productive employment, and allow competition in marketing, packaging of services, operator services/directory assistance systems, and the other "unshared" facilities. This competition provides additional options for consumers and pressures the ILEC to provide their own "unshared" functions more efficiently. For example, while rates in many States have foreclosed CLECs' ability to use UNE-P, it has provided important competitive alternatives in New York, Texas, and other states and has offered consumers protection against rate increases that they would not otherwise have. Indeed, recent articles report that the ILECs have been forced to respond to UNE-P competition in some states by *lowering* their prices for basic local services. *See, e.g.*, Brenda Rios, *SBC Ameritech Cuts Local-Telephone Call Rates for Michigan Consumers*, Detroit Free Press, (June 13, 2002) (Ameritech "is cutting residential rates by an average of almost $12 a year for 2.2 million consumers to keep them from switching to a growing

number of competitors. It's the biggest single payoff for SBC Ameritech customers since local phone service was deregulated in 1996.").

77. The Commission has long recognized the opportunity, under appropriate circumstances, to attain strong public interest benefits of "synthetic" competition, *i.e.*, competition from non-facilities-based carriers. *Resale Order*, 60 F.C.C.2d 261 (1976). There, the Commission ordered long distance carriers to permit other carriers to "resell" their services to end users. In so holding, the Commission observed that many carriers are not "in a position to construct facilities, due to regulatory, procedural, and economic limitations." *Id.* ¶ 10. However, through access to resale, non-facilities-based carriers were able to compete with facilities-based carriers in "marketing, retailing, brokerage and related functions" and thereby promote "[p]ublic enjoyment of state-of-the-art communications technology and full utilization of existing capacity."

78. The Court also noted that UNEs allow CLECs to enter and to build up a customer base that will allow them to deploy their own facilities, *USTA*, 290 F.3d at 424, and economic theory and the actual marketplace experience of the past 3 years has confirmed this benefit. As explained in the Brenner Declaration filed with AT&T's Initial Comments, AT&T initially attempted to serve business customers using a UNE-L configuration, but with little success. AT&T subsequently switched strategies and now uses UNE-P to serve low volume business locations, and in cases where it is technically and economically sensible to do so, they can be moved onto AT&T's own switch using a UNE-L configuration.

79. AT&T's move to UNE-P produced dramatic pro-competitive results. AT&T reports that it was able to add as many customers in a few months of using UNE-P than it was in two

years of using and UNE-L. And now that it has an established customer base, it has begun to transfer some of those customers over to the UNE-L configuration. Thus, AT&T's experience in this regard provides a vivid illustration as to why the availability of the full suite of UNEs is necessary, over time, to help create facilities-based competition.

80. *UNEs Have Not Suppressed Investment.* Although the ILECs' UNEs are generally characterized by substantial economies of scale and although TELRIC represents the efficient replacement cost of a facility for the ILEC, I previously testified, and the Commission previously found, that CLECs will "deploy alternative facilities as soon as it is technically and economically possible to do so at a cost that is close to the incumbent LECs' prices for network elements." *UNE Remand Order* ¶ 112; *see also id.* ¶ 7. That is so because CLECs incur other costs and disadvantages when they lease UNEs, and their effective overall unit costs can thus be lower when they are able to build their own facilities. In particular, CLECs then avoid the transactional, monitoring, litigation, and related costs of leasing from the ILEC; CLECs are not then dependent on their major competitors and potentially shifting perceptions of regulators toward essential inputs; and CLECs who have deployed certain facilities (switching and databases) have the unconstrained ability to differentiate their services from those provided by ILECs and to offer services that are superior to the ILECs' services. Willig Dec. ¶¶ 43-57.

81. In fact, recent marketplace evidence confirms that because of these considerations CLECs in fact *overdeployed* their own facilities despite the availability of TELRIC-based UNEs. There is a vast array of CLECs who invested tens of billions of dollars in many types of telecommunications facilities and who, quite simply, were not able to fill those

facilities with enough traffic to generate revenues needed to cover their facilities' and related support costs and investments. That is most dramatically the case with the long and growing list of facilities-based CLECs that have petitioned for bankruptcy protection or who have been liquidated in bankruptcy. *See* Willig Dec. ¶¶ 90-97 & Table 2.

82. Although some analysts have attempted to explain this massive volume of business failures as a function of "bad business plans" or inept management,[11] the list is far too long, and the business plans associated with these companies far too varied, to support such an overly-simplistic view. Moreover, the theory that bad management explains all of these CLEC failures is further belied by the fact that many CLECs identified as having "sound" business plans and "strong" management, petitioned for bankruptcy a short time after being so identified.[12] For example, a June 2001 report identified Allegiance, Time Warner Telecom, McLeodUSA and XO Communications as firms that had been frequently characterized by analysts as "survivors" with "experienced leadership" or "strong management."[13] However, less than a year later, *each* of these companies is in financial distress. Both McLeod and XO are now in bankruptcy, Allegiance reports severe financial problems, and Time Warner Telecom has sought the Commission's approval to withdraw from providing service in New York. *See* Willig Dec., Exhibit 1.

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[11] *See, e.g.,* Mark H. Redding, editor, CLEC.com, *Annus Horribilis? However you say it, CLECs have had a bad year*, (June 1, 2001) (available at www.adti.net/html_files/telecom/clec's_bad_year060101.html).

[12] *See id.*

[13] *Id.*

83. Similarly, despite the availability of UNE-P, AT&T's original strategy was to serve business customers exclusively through self-provisioned switches, and to rely on its fiber rings and self-provisioned loops where possible. Like other CLECs, AT&T made multi-billion dollar investments towards this end. But, as set forth in the Lesher-Frontera Declaration – AT&T's substantial local switching and local transmission facilities are severely underutilized.

84. The Supreme Court too has concluded that existing levels of investment belie any notion that TELRIC-based unbundling has sapped CLEC investment incentives. In its recent decision, it found that "a regulatory scheme that can boast such substantial competitive capital spending [*i.e.*, $55 billion] is not easily described as an unreasonable way to promote competitive investment in facilities." *Verizon*, 122 S. Ct. at 1676.

85. Similarly, unbundling does not impede ILECs' incentives to deploy new facilities. As set out in the Court's opinion, the ILECs have suggested two ways in which unbundling saps investment incentives. First, they argue that ILECs will not wish to invest in new facilities when regulated prices are below "true costs." *See* BellSouth at 46; Qwest at 48; Verizon at 27-33. I agree. But the regulated prices set under the Commission's TELRIC formula are *not* below "true costs." As I have testified repeatedly in the past, and as the Supreme Court has now held, TELRIC appropriately measures the ILECs' economic costs of deploying facilities.

86. In the alternative, the ILECs contend that even "cost-based" rates are insufficient in this context because CLECs can avoid the risks that the ILEC takes when investing in new facilities. *See* SBC at 17. Although that may be true of some types of cost-based rates, it

is definitely not true of TELRIC-based rates, which include a forward-looking, risk adjusted return on capital.

87. The Supreme Court has likewise specifically recognized that the depreciation and cost of capital components of TELRIC compensate ILECs for *all* the risks that they assume in deploying facilities. *See Verizon*, 122 S. Ct. at 1677 ("TELRIC itself prescribes not fixed percentage rate as risk-adjusted capital costs and recognizes no particular useful life as a basis for calculating depreciation costs" and, therefore, may be "adjusted upward if the incumbents demonstrate the need"). Further, because "TELRIC rates are calculated on the basis of individual elements," "TELRIC rates leave plenty of room for differences in the appropriate depreciation rates and risk-adjusted capital costs depending on the nature and technology of the specific element to be priced." *Id.* at 1678.

88. The ILECs' arguments are particularly ironic in this context, because their traditional complaint against TELRIC is that it does not permit them to recover costs that they incurred in the past to deploy technology that has subsequently become outdated. When considering ILEC incentives to invest in new facilities, however, TELRIC rates are likely to approximate "actual" ILEC expenditures very closely. Indeed, the only way that there would be a significant difference is if the ILEC used network architecture that was inefficient at the time that it was deployed. *See Verizon*, 122 S. Ct. at 1672 (recognizing any difference between TELRIC and actual costs are attributable to inefficiency). It is also important to recognize that unbundling can *decrease* the ILECs' risks of deploying new facilities. The principal risk an ILEC faces when deploying new facilities is whether there is sufficient demand for them. When an ILEC sells unbundled access to CLECs, it carries not only the traffic that its marketing generates, but *also* the traffic generated by

the CLECs' marketing efforts. Economics predicts that, overall, an ILEC will carry more traffic when multiple carriers use its facilities.[14]

89. And while the *USTA* Court did not require the Commission to demonstrate empirically that wide-spread deployment of UNEs does not sap either CLEC or ILEC investment incentives, there are now "multiple regression analyses," *USTA*, 290 F.3d at 425, showing this to be the case.

90. With regard to CLEC investment incentives, AT&T has been able to gather the data necessary to test whether the availability of UNEs impedes or enhances its incentives to deploy switches and transmission facilities. In his accompanying Reply Declaration, Dr. Richard N. Clarke uses these data to perform a regression analysis from which he concludes that, regardless of the structure chosen, the availability of UNEs *enhances* AT&T's incentives to invest in its own facilities.

91. This should not be surprising because, as explained above, basic economic theory predicts this result. First, in many cases, UNEs and facilities are complementary. For example, self-deployed switches can often only be used if unbundled loops are practically and economically available. Second, UNEs can serve as a bridge to facilities by allowing CLECs to gather a customer base and then transition to its own facilities. Third, CLECs

[14] The ILECs effectively concede this point when they say that they have economic incentives to offer multiple carriers access to their networks, but at "commercial" rates. Verizon at 82 ("The widespread deployment of broadband services and facilities will require enormous investments and result in huge fixed costs. Obviously, the more traffic on the network, the easier it is to recover those costs."). The ILECs, of course, would like to be able to offer this access at supracompetitive rates that are much higher than TELRIC would allow. *Id.*

would prefer to invest in their own facilities and avoid having to deal with a recalcitrant supplier.

92. In my Initial Declaration, I reported the results of an econometric analysis that tested the hypothesis that has been asserted by ILEC affiants that mandatory unbundling deters infrastructure investment. My analysis showed that the data soundly reject this hypothesis. Indeed, my analysis supported the opposite hypothesis, namely, that mandatory unbundling stimulates increased infrastructure investment by ILECs.

93. In particular, in my Initial Declaration, I tested the hypothesis that entry-accommodating pricing of UNEs discourages ILEC facilities investment by means of an econometric analysis of the relationship between UNE pricing and the pace of ILEC facilities investment among states. According to the point of view advanced by the ILECs, their own investment in facilities should be seen to have an increasing relationship to the prices of UNEs across states. On the other hand, the contrary hypothesis, which I also tested, implies an inverse, negative, relationship between UNE pricing and ILEC facilities investment. According to this line of reasoning, lower UNE pricing promotes CLEC entry, and the prospect of increased competition from CLEC providers stimulates ILECs to invest in additional facilities so as to be in a better position to compete. Thus, the two hypotheses yield opposing predictions about the direction of the relationship between UNE prices and ILEC facilities investment, taking into account the effects of other determinants of the level of ILEC investment.[15]

[15] The relationship is strengthened if it includes confirmation of the causal link that connects UNE prices to CLEC activities and then in turn connects the impact of CLEC activities on ILEC investment. As I explained in the Initial Declaration, the effect of UNE pricing on ILEC (continued . . .)

94. Since I filed my Initial Declaration, I have been able to expand and refine further my earlier analysis. I have been able to take advantage of additional and updated data that have subsequently become available. The extended analysis reported here was completed with the assistance of Dr. John Bigelow, Dr. William Lehr, and Dr. Stephen Levinson, and a detailed description of the analysis is included in the Appendix that accompanies this Reply Declaration. The details of the results are set forth in Exhibits 1, 2 and 3 of the Appendix. The new results reinforce the earlier analyses, offering even stronger support for the beneficial impact of mandatory unbundling rules on competition *and* ILEC infrastructure investment. Contrary to what the ILECs' view of the world would predict, lower UNE prices, which facilitate UNE-based entry by CLECs, result in higher, not lower, ILEC investment in telecommunications infrastructure.

95. Specifically, we have expanded by one year the cross-section data by state on the amount of ILEC investment between the end of 1996 and, now, 2001. We have obtained updated and more complete data on UNE-P pricing, average revenue, and total service resale discount percentages for all continental states. We now include an alternate variable for CLEC activity, the percent of zip codes in each state for which at least one CLEC is present. We continue to use data on population growth, unemployment rate, base level of ILEC capital per-capita, the share of the labor force employed in industries that make

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(. . . continued)
investment will, according to economic theory, be felt through a set of interlocking relationships. Economic theory teaches that ILEC investment will be influenced by its impact on ILEC profitability. That is, ILECs will choose investment levels to satisfy their own profit objectives. The effect of UNE pricing on ILEC profitability, and hence on ILEC investment, is necessarily indirect. UNE prices affect ILEC profitability by affecting the extent of CLEC entry and competition, which, in turn, directly affect ILEC profitability.

extensive use of telephone services, a TELRIC measure of the costs of providing local service, and data that describe the regulatory regime in a state.[16]

96. As in the Initial Declaration, our econometric methodologies suggest two approaches to investigating such a relationship. The first estimates the parameters of what is known as a "reduced form" relationship, and the second estimates the parameters of the "structural form" relationships. The two approaches have their comparative strengths and weaknesses. On the one hand, the reduced form approach has the virtue of simplicity. A single reduced form relationship can arise from a variety of different structural systems. Therefore, reduced form estimation is not sensitive to particular assumptions about the structural nature of the underlying system. On the other hand, it is often good econometric practice both to ensure that the specification of econometric models is grounded in reliable economic theory, and to examine econometric results not only for their purely statistical properties, but also for their quantitative and qualitative consistency with the predictions of economic theory and the assumed roles of the elements of the system. Structural estimation lays bare more of the underlying economic relationships, and so is more amenable to confirmation (or rejection) along these lines.

97. Here, as described in greater detail in the Technical Appendix and its Exhibits, we employ both methodological approaches in a complementary fashion. We have estimated

[16] States vary in the extent to which provision of telephone services is deregulated. *See* Communications Daily White Paper, *States' Retail Regulation of Local Exchange Providers* (March 26, 2002). In some states, ILECs' telephone service is largely deregulated, whereas in others, it is partially deregulated, perhaps with price caps or rate freezes, while in some states, traditional rate of return regulation continues. These variations in regulatory regime may exert influences over ILEC investment.

reduced form relationships in which ILEC investment in a state (scaled for the size of population) over the period from 1996 to 2001, or from 1996 to 2000, controlling for telecommunications demand factors, the rate of population growth, the baseline per-capita value of the ILEC's state-wide plant in service, and the regulatory regime.[17] Investment is also permitted to depend on average revenue per residential subscriber, the total service resale discount factor, a measure of the level of UNE-P pricing in the state and a TELRIC measure of the cost of providing local exchange telephone service.

98. The current results completely reinforce and strengthen the earlier results. In Exhibit 1, they indicate again that population growth exerts statistically significant positive effects on ILEC investment in the direction predicted by economic theory for both the original measure of ILEC investment from 1996 to 2000 and for the expanded measure through 2001.[18] Similarly, the TELRIC measure again exerts a statistically significant negative effect on investment, as predicted by economic theory because the TELRIC measure of cost, if it is estimated correctly, is the cost to the ILEC of providing local service. Some of the forms of the state-specific regulatory regimes are statistically significant factors in explaining the differences among the states' levels of ILEC investment over the late 1990s.

99. In the context of these influences, increases in the UNE-P price shows a negative effect on ILEC investment that is statistically significant according to the usual professional

[17] This relationship is econometrically estimated using ordinary least squares.

[18] The statement that the effects are statistically significant means that the probability that the observed effect is due to chance rather than a systematic effect has been calculated to be below a pre-specified low threshold.

standard.[19] In other words, the econometric results provide statistically significance support for the hypothesis that easing CLEC entry with lower UNE-P prices stimulates ILEC investment. At the same time, the econometric analysis establishes at better than the standard 5% level of statistical significance the rejection of the contrary hypothesis advanced by the ILECs that easing CLEC entry with lower UNE-P prices discourages ILEC investment.

100. Following the complementary approach, we have also estimated structural form relationships with our new data set to explain both ILEC investment (again for both 1996 to 2000 and for 1996 to 2001 data sets) and the level of CLEC activity. As before, any impacts of UNE-P prices or the total service resale discount rate on ILEC investment are felt through their impacts on state-specific CLEC activity, which is among the direct influences on ILEC investment. ILEC investment is also permitted in the specification to be influenced by state-specific demand factors, TELRIC measures of costs, and the other variables listed above in the description of the reduced form. The level of CLEC activity in its own structural relationship is permitted to depend on demand factors, UNE-P prices, the total service resale discount rate, and the average revenue per residential subscriber. The available data on the level of CLEC activity were again the numbers of CLECs registered to offer service in each state. In order to further test the strength of this hypothesis, we now also measure the level of CLEC activity using the percent of zip codes in each state having at least one CLEC. This alternate measure serves as a check

[19] The effect is now statistically significant at the better than the 5% level. Thus, if the threshold for statistical significance is the conventional 5%, this effect is easily significant. In the previous study, the effect was nearly significant at that level.

on the structural system that we posit, and may reinforces our reliance on the statistical results if the same result is achieved.

101. The estimation of this system is repeated for both measures of the CLEC dependent variable, as reported in Exhibits 2 and 3, and the two interrelated structural equations yield strong results that confirm and strengthen the findings from the reduced-form estimation in each case. Here, higher UNE-P prices discourage CLEC entry into states' local telephone markets. The effect is negative and statistically significant for both measures of CLEC activity.[20] In the ILEC investment relationship, both the number of CLEC entrants and the percentage of zip codes with CLECs exert a positive effect on ILEC investment at better than the 5% level of statistical significance. Thus, ILEC investment is stimulated, controlling for other influences, by greater CLEC activity by either measure, and CLEC activity by either measure is in turn positively responsive to lower UNE-P prices. These effects are again statistically significant, so it is indicated that it is environments conducive to CLEC activity that stimulate ILEC investment, and that state environments that are discouraging to CLEC activity result in suppressed levels of ILEC investment. In particular, these econometric results again clearly reject the hypothesis asserted by the ILECs that lower UNE-P prices stifle ILEC investment. The results are all the stronger because they are validated with data for a greater number of states than before, with better measures of UNE rates, and with an alternate measure for CLEC activity.

[20] This effect is statistically significant at better than the standard 5% level.

102. In short, there is no basis in the data for the ILECs' assertion that UNE-P and UNEs discourage investment by ILECs or CLECs. Indications are that the effect is precisely the opposite, and that effective UNE-P competition leads to greater investment by ILECs as well as by CLECs. This hard evidence confirms the "commonsense . . . that so long as TELRIC brings about some competition, incumbents will continue to have incentives to invest and improve their services to hold on to their existing customer base." *Verizon*, 122 S. Ct. at 1676 n.33.

103. Finally, the analysis also answers the Court's related concern that "the closer the Commission's pricing principle is to the low end of what may lawfully [be] set, the greater the probability that lack of access would [be said to result in a] 'material diminution' [of the requesting carrier's ability to provide the services in question]." *USTA*, 290 F.3d at 425 n.2. The Commission's past determinations that CLECs were impaired without access to loops, switches, and transport did not rest on a comparison between the costs of self-deployed facilities and the prices that the incumbent charges under TELRIC. Rather, it was based on qualitative and other factors that inherently meant that CLECs incurred substantially higher unit costs in deploying facilities and that they would incur material delays and similar impairments if they had to rely on self-provisioned facilities.

104. For example, with regard to local switching, the Commission found that CLECs were impaired in most locations from self-deploying switches because, *inter alia*, of costs and delays inherent in the collocation process and because of the inability of ILECs to provide commercially reasonable coordinated loop cutovers. *UNE Remand Order* ¶¶ 263-66. Similarly, with regard to transport, the Commission found impairment

principally because of costs and delays associated with necessary collocation arrangements and the inability of CLECs to secure in a timely fashion (if at all) necessary "rights-of-way, pole attachments, and conduit space." *UNE Remand Order* ¶¶ 357, 361-64.

VI. EXISTING LEVELS OF INTERMODAL COMPETITION DO NOT PREVENT THE COMMISSION FROM UNBUNDLING LOOPS.

105. The *USTA* decision also vacated the *Line Sharing Order* on the ground that the Commission had ordered the unbundling of the high frequency spectrum of the loop that would allow CLECs to provide DSL-based services without considering the relevance of competition in broadband services from cable, satellite, and other providers of high speed Internet access. *USTA*, 290 F.3d at 428-30.

106. In my Initial Declaration in this proceeding – and Declarations that I have filed in the ILEC Broadband Dominance Proceeding (CC Docket No. 01-337) and Wireline Classification Proceeding (CC Docket No. 02-33) – I have already provided extensive analysis that justifies the Commission's decision in the *Line Sharing Order*. Accordingly, I summarize the relevant parts of that testimony below and incorporate it by reference.

107. *USTA* requires the Commission to consider whether substitute services that are offered outside the ILEC network have led to the profitable provision of services by multiple providers. That is plainly not the case for voice services. The only significant intermodal voice competitors faced by the ILECs are the cable operators. In general, however, there is, at most, only a single cable network in any geographic region. Thus, even if every cable operator had aggressively upgraded its network to provide cable telephony in

competition with the ILEC that would, at most, create a duopoly. Although such offerings might put some pricing pressure on the ILECs, a single competitor may not force ILECs to align their rates with costs. Clearly, it would further the public interest to permit unbundling that would facilitate greater levels of competition that would benefit consumers.

108. Of course, most cable operators have not made the substantial investments necessary to offer cable telephony, and those that have done so have only recently entered local telephone markets. As a result, cable telephony is still nascent and has to date attracted only a tiny share of the market. *Local Telephone Competition*, Table 5 (Feb. 2002). Cable offerings are also limited to residential areas, and provide no alternative for business customers.

109. Finally, it is also important to recognize that cable-based competition is, in many respects, *sui generis*. Cable operators, like ILECs, historically enjoyed exclusive franchises. The facilities used to provide cable services also enjoy substantial scale economies and sunk costs. Cable operators, therefore, are in a unique position to enter local telephone markets because the networks that they have already built, which pass the overwhelming majority of homes, can be upgraded to also provide telephony. To achieve a comparable position, CLECs would have to replicate nearly ubiquitous cable networks. But given the natural monopoly characteristics of these networks, that is simply not economically feasible.

110. My conclusions do not change with regard to the high frequency portion of the loop. To be sure, ILEC DSL services do compete head-to-head with cable modem services in

some – but not all – geographic regions.[21] But ILECs have particularly strong incentive to "slow roll" deployment of broadband networks and maintain high prices that existing levels of cable competition have not been able to check. This is because broadband services "cannibalize" existing high margin services currently provided by ILECs. Willig Dec. ¶¶ 173-74. When the ILECs deploy broadband, there can be a "ripple effect" – customers cancel second lines or ISDN services and diminish the ILECs' overall profits. *See Communications Daily* at 2 (Feb. 21, 2000) (quoting Robert Pepper, Chief of the Commission's Office of Plans and Policy).

111. Financial analysts have also reached this conclusion.

> [A] negative side effect of adding a DSL subscriber is the potential loss of a second line that the customer had previously subscribed to. *SBC estimates that as much as one-half of customers with second lines that sign up for DSL service disconnect their second lines, Verizon estimates that this figure is closer to three-quarters.* Although on the surface, adding a $50 revenue stream per month, while sacrificing a $25 per month second line revenue stream may seem like a positive tradeoff, the underlying economics may not lead to the same conclusion, particularly if we are only at the first-year effect. Second lines generate only $25 per month in revenue and come at a very low incremental cost to the provider, implying very high returns. Alternatively, DSL requires significant upfront acquisition costs as well as infrastructure costs. We estimate the key to this tradeoff is the length of time that a DSL customer is retained. For instance, with low churn assumptions, a DSL customer can over time produce very healthy returns on capital and therefore outweigh the loss of a second line voice customer. With higher churn, DSL's payback period is longer, lowering returns on capital and effectively making the cannibalization of second voice lines slightly more harmful. *A DSL subscriber often comes at the expense of a disconnected second line, which means $25 in high-margin revenues are lost.*

[21] Competition from satellite and fixed-wireless providers, while once promising, has so far failed to materialize. Thus, the only significant current alternative to the ILECs' DSL-based services is cable modem services.

Goldman Sachs, *Telecom Services*, at 15 (June 11, 2002) (emphasis added). And I suspect that it is for these reasons that the ILECs have recently stated that DSL is priced "too low." Vikas Bajaj, *Phone, Broadband Prices Too Low, Verizon Exec Says*, Dallas Morning News (June 5, 2002) ("Digital subscriber lines, which cost about $50 a month today, should be 40 percent to 50 percent more expensive, [Verizon's Vice Chairman and President] told reporters at a news conference.").

112. In the past, when there were multiple carriers offering DSL services, the ILECs had no alternative but to deploy broadband services aggressively and to keep prices low. Where there is both intramodal and intermodal competition, the ILECs recognized that failure to deploy DSL-based services would not allow them to preserve monopoly profits derived from existing services because their customers would simply chose the broadband offerings of their competitors and then cancel the ILEC-provided second lines or ISDN service. But as the "data LEC" industry began to crumble and this competitive constraint disappeared – indeed, the ILECs now have a 94% share of the residential DSL market and a 90% share overall in DSL[22] – the ILECs again began to act on their incentives. The ILECs uniformly raised the prices of their lowest bandwidth DSL offerings by 25 percent, with some ILECs maintaining or slightly lowering the price of their highest bandwidth offerings (but still setting them at a level in excess of the rates charged for cable modem services). Thus, the ILECs raised prices for the lower-bandwidth DSL services that are most likely to attract current narrowband users (*i.e.*, the most likely substitutes for narrowband), but lowered the price for users who highly value speed and

[22] *See* TeleChoice First Quarter 2002 DSL Deployment Summary Chart (available at http://www.xdsl.com/content/resources/deployment_info.asp).

who would be most likely to be attracted to the relatively high-speed, moderately-priced service offered by the cable companies (although the ILECs still found it profitable to maintain prices well in excess of cable modem services).

113. In sum, cable competition, even if it were uniform and ubiquitous, provides, at most, only a single alternative to the ILEC. And DSL is the only choice for many consumers, particularly small businesses that uniformly have no cable option. Further, for the reasons explained above, CLECs also cannot compete with ILECs by replicating cable networks, which have natural monopoly characteristics. Vigorous intramodal DSL-based competition, therefore, can check the ILECs' market power by giving consumers voice/DSL alternatives from multiple carriers that would not have to match the ILECs' price increases.

VERIFICATION

I, Robert Willig, declare under penalty of perjury that the foregoing is true and correct. Executed on July 16, 2002.

Robert Willig

Robert Willig

Technical Appendix – Econometric Analysis of ILEC Investment

I. Introduction and Background

1. The purpose of this appendix is to describe the econometric analysis of the effects of regulatory-mandated unbundling provisions on carriers' incentives to invest in network infrastructure that is referred to in my Reply Declaration. This analysis investigates the relationships among UNE pricing, CLEC activity and ILEC investment. The analysis reported here is a continuation of the work on which I reported in my Initial Declaration and in its accompanying technical appendix. The latest work takes advantage of a richer set of data with which to test the key hypotheses, and its results reinforce and expand the previous analysis and conclusions.

2. As I described in my Initial Declaration, this empirical inquiry is motivated by the goal of testing alternative hypotheses regarding the effect of mandatory unbundling provisions, such as those mandated by the Telecommunications Act of 1996, on incentives of carriers to invest in network infrastructure. One hypothesis is that mandatory unbundling reduces incentives to invest because it denies incumbents (the ILECs) a sufficient opportunity to earn a "fair return" on its infrastructure investment, and encourages competitors (the CLECs) to free-ride on incumbents' investments.[1] This is the view that has been advanced in testimony submitted on behalf of the ILECs. In the rest of my testimony, I will refer to this view as the "investment-deterrence" view of unbundling. An alternative hypothesis is that regulatory unbundling enhances incentives to invest because it promotes competition. Under this view, regulatory unbundling helps reduce economic barriers to entry that would otherwise be faced by CLECs. The increased competition impels CLECs and ILECs alike to strive to improve quality and lower costs to better serve consumer interests. Because CLEC entry is encouraged by unbundling, CLEC investment in infrastructure increases.[2] Moreover, the increased competition also stimulates investment by ILECs both to meet CLEC demand for infrastructure (*i.e.*, under the TSR and UNE rules) and to respond to the competitive pressure better to meet the needs and desires of ILEC customers who might otherwise be induced to switch their retail demand to the new CLECs. As I explain further

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[1] Of course, if UNE prices were so low as to be below the corresponding forward-looking economic costs (FLEC) in the same geographic area for the same service, then an over-reliance on ILEC facilities by CLECs might arise.. A firm must expect to recover its economic costs if it is to invest. Therefore, UNE prices that are below FLEC would discourage investment by the ILEC and may encourage inefficient entry by CLECs who are thereby induced to lease UNEs. . Despite the fact that it is often asserted by the ILECs, this is, however, an argument that has been foreclosed by the findings of this Commission, virtually fifty state commissions and the Supreme Court of the United States that TELRIC-based UNE prices are presumptively fully compensatory to the ILECs.

[2] Entry via UNEs and TSR often complement and help facilitate investment in CLEC infrastructure. The data and analysis presented here, however, do not allow us to investigate how CLECs allocate their investment between their own infrastructure and investments that complement facilities leased from the ILEC. Moreover, the total investment by a CLEC includes support of non-network related business activities (*e.g.*, establishing a brand image and retail operation). And, of course, increased investment by carriers encourages increased investment elsewhere along the value-chain (*e.g.*, by carrier and customer equipment manufacturers).

below, I believe there is strong evidence favoring this second view, which I refer to as the "competitive-stimulus" hypothesis.

3. The *investment-deterrence* hypothesis (*i.e.* carrier investment incentives reduced with unbundling) and the *competitive-stimulus* hypothesis (*i.e.*, carrier investment incentives increased with unbundling) are diametrically opposed, and hence there is reason to hope that an econometric analysis investigating the relationship between ILEC and CLEC infrastructure investment and regulatory unbundling would allow the determination of which of the two propositions is more likely to reflect reality.

4. The econometric analysis that might be undertaken is constrained by the available data. While the FCC's ARMIS reporting system provides ready access to state-by-state estimates of network investments by the largest ILECs, the Bell Operating Companies (BOCs), I am unaware of any comparably good data source for measuring CLEC investment in infrastructure by state. Many of the CLECs are privately held and report little data on their investments. Others are part of larger entities and do not separate CLEC investment from other investments in their reports. Even reported CLEC investment data are usually insufficiently disaggregated on a consistent basis for present analytic purposes. Fortunately, however, while it is not possible directly to measure CLEC investment by state, there are several data sources available for measuring CLEC activity by state.

5. There is a second data issue associated with the measurement of state-by-state differences in the status of regulatory unbundling rules under the Telecommunications Act of 1996. The ability and incentive of a CLEC to use leased unbundled network elements depends both on the prices of those elements and on the availability on non-discriminatory terms of appropriate Operating and Support Systems (OSS). Unfortunately, I was unable to locate any reliable data on the status of OSS implementation by state. However, there are reasonable data on UNE pricing.

6. In light of the data constraints, this analysis focuses on the relationships among ILEC investment in local telecommunications infrastructure, CLEC activity, and UNE prices. The investment-deterrence hypothesis is that lower UNE prices would be associated with lower ILEC investment; while the competitive-stimulus hypothesis would be the reverse, that lower UNE prices would be associated with higher ILEC investment.

7. The recent decision by the United States Court of Appeals points to the importance of this empirical analysis. In its decision, the Court concluded that, "There are plainly two sides to the effects on investment of ubiquitously available UNEs at Commission-mandated prices."[3] The court went on essentially to mandate an empirical approach to the question. "The question is how such investment compares with what would have occurred in the absence of the prospect of unbundling, . . ., an issue on which the record appears silent. Although we can't expect the Commission to offer a precise assessment of disincentive effects (a lack of multiple regression analyses is not ipso facto arbitrary and capricious) we can expect at least some confrontation of the issue and some effort to make reasonable trade-offs. . . . [T]o the extent that the Commission

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[3] *United States Telecom Association v. FCC*, 290 F.3d 415, 425 (D.C. Cir. 2002).

orders access to UNEs in circumstances where there is little or no reason to think that its absence will genuinely impair competition that might otherwise occur, we believe it must point to something a bit more concrete than its belief in the beneficence of the widest unbundling possible."[4]

8. The two competing hypotheses raise empirical questions at two different levels. First there is the question of the direction of the effect of UNE prices on ILEC investment. Once that is determined, there is the further question of whether or not there is empirical support for the underlying mechanism upon which the hypothesis is based. My empirical analysis is organized along these lines. To start, I specify and estimate a reduced-form model that enables me to determine empirically the direction of the effect of UNE prices on ILEC investment. The results of that estimation are inconsistent with the investment-deterrence hypothesis, but are consistent with the competitive-stimulus hypothesis. Specifically, the data indicate that higher UNE prices are associated with lower rates of ILEC investment. I turn, then, to a more detailed empirical investigation of the underpinnings of the competitive-stimulus hypothesis. The results of this estimation are consistent with the explanation provided by the competitive-stimulus hypothesis for the negative relationship between UNE prices and ILEC investment. Specifically, the level of CLEC activity is negatively related to UNE prices and the level of ILEC investment is positively related to CLEC competitive activity.

II. The Reduced Form

A. Specification

9. My initial analysis of the relationship between UNE prices and ILEC investment is based on a reduced-form specification of the determinants of ILEC investment. A reduced-form specification is one that is derived from a more complex set of simultaneously interacting relationships. In a reduced-form specification, interactions between variables that exert mutual effects on one another have been pushed into the background and the relationship to be estimated is a straightforward relationship between predetermined independent (or "exogenous") variables and a single dependent variable. By contrast, structural form relationships embody those interactions explicitly, have meaningful behavioral interpretations, and, generally, must be viewed as a collective system of relationships.

10. For example, in the standard economic model of a competitive market, the quantity demanded of a good is determined by its price, the levels and distribution of income of its consumers, the prices of substitute and complementary goods, and parameters that reflect tastes. Likewise the quantity supplied of a good is determined by its price, the prices of goods and services used to produce the good, and parameters describing the technology for producing the good. In the marketplace, the price of the good is determined by simultaneous operation of the demand relationship, the supply relationship, and the equilibrium condition that the quantity demanded should be equal to the quantity supplied. In this model, two relationships, the demand relationship and the supply relationship, interact simultaneously to determine two variables, the quantity of the good changing hands in the market and the market price. The values of these two

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[4] *Id.* at 426.

"endogenous" variables are simultaneously determined by the demand and supply relationships and the values of the predetermined or exogenous variables such as income, prices of substitutes and complements, taste parameters, prices of factors of production, and technology parameters. If one knew the demand and supply relationships, one could use them to calculate the market equilibrium price as a function of the exogenous variables. The resulting relationship is called a reduced form, because the simultaneous interaction of multiple relationships and variables has been reduced to a single relationship between the endogenous dependent variable and the exogenous independent variables. The structural form relationships have a specific behavioral interpretation but their interaction is more complex. The reduced form is simpler than the structural form because a variety of behavioral relationships have been subsumed into it.

11. In this case the reduced-form relationship is between ILEC investment, the dependent variable, and a group of exogenous variables that influence ILEC investment either directly or indirectly through their effect on CLEC activity. The reduced-form relationship takes the form

$$\begin{pmatrix} ILEC \\ Investment \end{pmatrix} = R\begin{pmatrix} Demand \\ Factors \end{pmatrix}, \begin{pmatrix} Current \\ Revenue \end{pmatrix}, \begin{pmatrix} ILEC\,Cost\,of \\ Investment \end{pmatrix}, \begin{pmatrix} CLEC\,Cost\,of \\ Participation \end{pmatrix}, \begin{pmatrix} Regulatory \\ Regime \end{pmatrix}.$$

The Demand Factors, ILEC Cost of Investment, and Regulatory Regime variables are included to control for the impact of other factors on ILEC investment decisions – that is, factors not associated with UNE-based unbundling requirements. Demand factors and the level of current revenue (an indication of current market prices), are included because they may be expected to affect ILEC investment directly, inasmuch as increased demand or higher prices should be expected to encourage investment, and indirectly, because they should have the same effect on CLEC activity. The cost to an ILEC of its own investment should certainly influence the level of ILEC investment. Variables relevant to the nature of the regulatory regime are also included because these may be expected to have an effect on ILEC investment.

12. The CLEC cost of Participation variable is the variable whose coefficient provides the basis for distinguishing between the two competing hypotheses. According to the investment-deterrence hypothesis, increases in UNE prices, which increase the cost of CLEC participation via unbundled network elements, should increase ILEC investment. It does this because higher UNE prices render UNE-based entry less economically viable for CLECs, and thereby reduces CLEC competition, which protects the ILEC from any risk of alleged free-riding by CLECs. According to the investment-deterrence hypothesis, this should increase the ILEC's incentive to invest. In contrast, the competitive-stimulus hypothesis predicts that higher UNE prices will reduce ILEC investment because less economically-viable UNE unbundling reduces CLEC competitive activity and the positive spur that it would otherwise provide for ILEC investment.

13. Thus, empirically one may distinguish between these two hypotheses by examining the signs and the levels of statistical significance of the estimated coefficients on the CLEC cost of participation variables.

B. Data

14. To test the econometric relationships among ILEC investment, CLEC activity, and UNE pricing, data were collected from a variety of sources. These data can be grouped into four categories: (1) ILEC investment ; (2) UNE prices; (3) ILEC cost of Investment; and (4) Control variables for other exogenous effects.

1. ILEC Investment

15. Data on BOC investment by state are provided in the FCC's ARMIS reports, which include data by state and by year for each of the major BOCs in Table 43-02 B6 Summary of Investment and Accumulated Depreciation.[5] Gross investment is reported as "Telephone Plant Additions." Net TPIS is computed as "Total Plant in Service at end of year" minus "Accumulated Depreciation at end of year." From these data, a measure of the net capital at the end of each year is constructed as the difference between the Total Plant in Service (TPIS) and the Accumulated Depreciation at the end of the year.

16. Net investment may then be calculated as the difference in net capital from one year to another. In my Initial Declaration, I focused on the change in net capital, net TPIS, over the four year period from 1996 to 2000 to smooth out any year-to-year variations in measured investment that may arise from differences in accounting and economic conventions for measuring capital. Since that analysis was prepared, data for ILEC TPIS for 2001 have been made available and so I also compute the change in capital over the five year period from 1996 to 2001 as an alternative measure for ILEC net investment. Additionally, both estimates are divided by state population in the year 2000 (or, 2001).[6] Dividing by state population controls for differences in the level of ILEC investment due to differences in the size of a state.

17. These variables are referred to in the results tables as *Investment to 2000* and *Investment to 2001*, respectively. They refer to the change in net TPIS per capita from 1996 to 2000, or from 1996 to 2001, respectively.

2. UNE Prices

18. The measure of UNE prices is similar to the one I used in my Initial Declaration. It is the state-specific rate for UNE platform service (UNE-P) for zone 1 (the most dense) in each of the states. Because UNE rates are set somewhat differently in each state and because UNE-P rates

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[5] The ARMIS reporting data are available on-line at http://www.fcc.gov/wcb/armis/db/. We excluded data on GTE, which is now part of Verizon, because of inconsistencies with other data sources used in the analysis. Therefore, the BOCs included were SBC (including what used to be SNET); Qwest (formerly US West); Verizon (excluding GTE); and BellSouth.

[6] The data on state population is for state-wide population from the 2000 Census. The statewide population for 2001 (and for other years when needed) is estimated by extrapolation, using the growth in statewide population between the 1990 and 2000 Census. Data on statewide population for the 1990 and 2000 Census are available on-line from the http://www.census.gov.

include both traffic and non-traffic sensitive and recurring and non-recurring rate elements, it is not a simple matter to obtain an internally consistent set of estimates of UNE-P rates by state.

19. Therefore, as I did in my Initial Declaration, I have relied on AT&T to provide state-by-state estimates of UNE-P rates for the purposes of my analysis here. In March, when I prepared my earlier analysis, AT&T did not have a complete set of UNE-P estimates, which substantially reduced the number of states that I could include in my sample. This updated analysis replaces the earlier estimates of UNE-P with the most current set of UNE-P rates by state that was available from AT&T (*i.e.*, as of the end of June 2002). This updated sample includes an estimate for all of the lower 48 states, which significantly increases the size of my sample.

20. AT&T did not have available a comparable set of data for prior time periods, so in addition to including additional states, the UNE-P rates also reflect changes in UNE rates that may have occurred since March 2002 (*e.g.*, because regulatory authorities in a state decide to alter rates or because of changes in estimates of the traffic assumptions used to estimate traffic-sensitive elements such as switching). Furthermore, it should be noted that current UNE-P rates provide a noisy indicator of the level of UNE-P rates that influenced ILEC investment behavior and CLEC activity, as measured.

3. ILEC Cost of Investment

21. The ILEC cost of investment is measured by TELRIC costs as estimated by the FCC's Synthesis Model for Universal Service.[7] I use the access-line-weighted state average across all switched access lines for all density zones. The TELRIC costs are available for all of the lower 48 states. Since my sample is a cross section, there is no variation in the financial cost of capital over time with which I need to be concerned. My specification assumes that this factor does not vary in the cross section from state to state. *Ceteris paribus*, one should expect that higher TELRIC costs would result in reduced ILEC investment (*i.e.*, the coefficient on TELRIC ought to be negative).

4. Control Variables for Other Exogenous Effects

22. In addition to UNE rates and the level of CLEC activity, there are a number of other factors that might reasonably be expected to influence the level of ILEC investment. I included a number of additional variables to control for these other influences.

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[7] The TELRIC estimate of the cost of the network platform (UNE-P) is derived from the FCC's Synthesis Model for universal service, adjusted to yield total switched local network costs. This model estimates the TELRIC for providing local telephone and access services. It includes a return for invested capital and an allowance for general overhead costs (see Fifth Report and Order, In the Matter of Federal-Joint Board on Universal Service (CC-Docket No. 96-45) and Forward Looking Mechanism for High Cost Support for Non-Rural LECs (CC-Docket No. 97-160), Before the Federal Communications Commission, October 28, 1998. The model may be obtained from the FCC's website at http://www.fcc.gov/ccb/apd/hcpm/). The adjustments to the model to include costs for providing intraLATA toll and access services are explained in Ex Parte Presentation by AT&T to Federal Communications Commission, In the Matter of Application by Verizon New England, Inc. Bell Atlantic Communications, NYNEX Long Distance Company, and Verizon Global Networks to Provide In-Region InterLATA Services in Massachusetts, CC Docket No. 01-9, February 1, 2001

23. First, to control for the effect of the level of telephone prices in the state, I included *Average Revenue* which is a measure of the average revenue collected per residential line in the state. These data were provided by AT&T and are based on the state's residential line distribution by density zone, tariffed local service rates, TNS Telecoms Bill Harvesting Study: 1Q01-3Q01 for features, local minutes of use drawn from ARMIS business and residential data, and toll-related minutes of use drawn from TNS Telecoms Bill Harvest research. *Ceteris paribus*, one should expect that higher prices ought to result in higher ILEC investment by state (*i.e.*, the coefficient on *Average Revenue* should be positive).

24. Second, to control for sundry other demographic and economic features of each state that may affect either the demand for or the cost of providing telecommunication services in the state (which in turn, might be expected to affect the level of infrastructure investment), I included three demographic variables. These included *Labor Force Share in FIRE* -- the share of the labor force employed in Finance, Investment, and Real Estate (FIRE) in 2000;[8] *Population Growth* – percentage growth in statewide population from the 1990 to 2000 Censuses;[9] and, *Average Unemployment* – average rate of unemployment in the state from 1996 to 2000.[10] Because firms in the FIRE sector of the economy are relatively heavy users of information technology services, faster population growth and lower unemployment suggest a growing economy and growing demand for telecommunication services, one should expect positive coefficients for *Labor Force Share in FIRE* and *Population Growth* and a negative coefficient for *Average Unemployment.*

25. Third, to control for other differences (*i.e.*, not related to UNE unbundling) in the form of state regulation, I include two additional types of variables. The *TSR Discount Percentage*, which is the current TSR discount set by state regulation, provides a measure of the cost of CLEC entry via total service resale. A higher TSR discount means that the cost of CLEC-based entry via resale is lower. These data were provided by AT&T. *Ceteris Paribus*, one would expect the *TSR Discount Percentage* to have a similar effect on ILEC investment as UNE rates.

26. In addition, I include a collection of dummy variables to control for the nature of the regulatory regime as it pertains to the major ILEC in each state. The data for these variables are from a report by the National Regulatory Research Institute.[11] This report characterizes the regulatory regime in each state as of October 2000 in one of five categories: 1) Rate of Return

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[8] The data on employment composition by state are from the 2000 Census as reported in the State Annual Tables that report State Economic Profiles (SA-3) which are produced by the Bureau of Economic Analysis of the U.S. Department of Commerce (September 2001). These data are available at http://www.census.gov.

[9] The data on state population is for state-wide population from the 2000 Census. The statewide population for 2001 (and for other years when needed) is estimated by extrapolation, using the growth in statewide population between the 1990 and 2000 Census. Data on statewide population for the 1990 and 2000 Census are available on-line from the http://www.census.gov.

[10] The data on the average unemployment by state are available from the Bureau of Labor Statistics for each year from 1996 through 2000. This data is available on-line at http://www.bls.gov. There was no unemployment data for Michigan for 1998 through 2000.

[11] The source of the data is from a table "Forms of Regulation for Basic Service in the U.S. States," from the State Telephone Regulation White Paper, National Regulatory Research Institute, as of October 2000.

Regulation, 2) *Price Cap Regulation*, 3) *Price Cap/Interim Rate Freeze*, 4) *Rate Freeze Non-indexed Caps*, and 5) *Deregulation*. For purposes of estimation I have assigned each state the regulatory form applicable to residential service provided by the major ILEC, and have constructed five indicator variables, one for each form. The indicator variables, commonly called dummy variables, take on the value 1 in each state where that regulatory form prevails, and are zero elsewhere, with rate of return regulation taken to be the "omitted" dummy variable in the estimating equations. All but one of the dummy variables are included in the regression. [12]

27. Fourth, I include *1996 Plant in Service* to control for the infrastructure that was in place in each state as of 1996. This is the net TPIS by state from the ARMIS data used to compute my measure of the level of ILEC investment, described above.

C. Estimation

28. The results of estimating the reduced form are shown in Exhibit 1. In Exhibit 1, the independent variables are listed in the first column and regression results are listed in the following two columns. Exhibit 1 shows the results of estimating two versions of the reduced-form model described above. In the first version, shown in the second column, the dependent variable for ILEC investment is *Investment to 2000* (*i.e.*, per capita change in net TPIS from 1996 to 2000), and in the second version, shown in the third column, the dependent variable is *Investment to 2001* (*i.e.*, per capita change in net TPIS from 1996 to 2001). The second and third columns of Exhibit 1 show estimated coefficients for each independent variable with the associated *P* value shown in parentheses under the estimated coefficient.

29. The estimated coefficient is the estimated value of the effect of a change in the independent variable on the value of the dependent variable. If an estimated coefficient is positive, increases in the independent variable are estimated to cause the dependent variable to increase. The size of the coefficient is the estimated rate of increase. If the estimated coefficient is negative, then increases in the independent variable are estimated to cause the dependent variable to decrease. The *P* value is a measure of the statistical significance of the estimated coefficient. Statistical significance is measured by the *P* value in probabilistic terms. Specifically, the *P* value reports the probability that the estimated coefficient would have been as large as it is if the true (but unknown) coefficient were equal to zero. A *P* value of .05 or .01 indicates only a 5% or, respectively, 1% chance of obtaining at least the estimated coefficient if the true coefficient were zero. The complement of the *P* value (in the foregoing, 95% or 99% respectively) is called the confidence level at which the coefficient is statistically significant.[13]

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[12] The Dummy variables included in the regression are in italics. All five can not be included because every state falls in one and only one of the categories. Therefore, collectively the five variables add up to a constant variable, which the regression includes. Regression calculations re not possible when two or more variables are redundant (technically, linearly dependent) in this fashion. Therefore, one is omitted. The estimated coefficients on the remaining variables should be interpreted as the differential effect of the indicated category relative to the category whose dummy variable was omitted.

[13] Thus lower *P* values are represent higher levels of confidence and *vice versa*.

30. Following the estimated coefficients and their associated *P* values is a set of summary statistics for the regression as a whole. The R^2 statistic measures the proportion of the variation in the dependent variable for which the estimated relationship can account. The adjusted R^2 makes a similar measurement adjusted for the number of independent variables included (more independent variables tends to make it easier to account for more variation) and the number of observations (more observations employed tends to make it harder to account for more variation) employed.(The difference between the number of observations and the number of variables included is often called the degrees of freedom.) There is also a *P* value for the regression as a whole. This *P* value reports the probability that the regression could account for as much variation as it does if there were no meaningful relationship between the dependent variable and any of the independent variables. It is, therefore, a measure of the statistical significance of the relationship as a whole.

31. The results shown in the second column indicate that the model does a good job of accounting for variation across states in ILEC investment, as measured in per capita terms between 1996 and 2000. The regression accounts for over 77% of the variation in the investment variable (just under 70% on a degrees-of-freedom-adjusted basis), and the regression as a whole is statistically significant at a very high level. Moreover the estimated coefficients that are statistically significant at the 95% level or better are consistent with expectations derived from economic theory.[14] According to these results, ILEC investment is encouraged by a larger fraction of the workforce in finance, investment and real estate, by growth in the population and by regulators that allow telephone companies to charge higher prices. Investment is discouraged by higher TELRIC costs, indicative that the cost of investing in, and operating, the network infrastructure is relatively high.[15]

32. In addition to these findings, the estimated coefficient on the UNE price is negative and statistically significant. This means that after taking into account all the factors accounted for by other independent variables in the regression, higher UNE prices discourage ILEC investment. Thus, the results provide strong support for the competitive-stimulus hypothesis, which cannot be rejected in favor of the null hypothesis (*i.e.*, there is no relationship between UNE pricing and ILEC investment). In contrast, the investment-deterrence hypothesis can be rejected.

33. The third column shows the results of estimating the same model except that the dependent variable is *Investment to 2001*. Comparing the second and third columns of Exhibit 1 shows that the results are essentially the same with this alternate investment measure that incorporates the additional information on ILEC investment that became available after I filed my Initial Declaration. With the exception of one variable, the same variables that were

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[14] The coefficient on *TSR Discount Percentage* is not significant at any reasonable probability level. Dropping this variable from the regression does not substantively change the results.

[15] The results in both columns are based on a sample of 47 observations, all 48 continental states except Michigan for which no unemployment figure is available. (See note 10.) When an approximate value of unemployment for Michigan is included, the results change in a few insignificant digits, but there is no substantive change in the results. (The approximate value is obtained by calculating an average ratio between Michigan's state unemployment rate and the national unemployment rate for years in which data are available, and applying that average ratio to the national rate in the years in which Michigan's data are missing.

statistically significant at the 95% or better level in the second column are significant at the 95% level or better in the third column, and their signs are unchanged. The one exception is the share of the labor force employed in finance, investment, and real estate, which is statistically significant at the 94% level in the third column.

34. The estimated coefficient on the UNE price in this column is negative and statistically significant at the 99% level. As with the second column, these results lead to outright rejection of the investment-deterrence hypothesis and provide support for the competitive-stimulus hypothesis.

III. The Structural Form

A. Specification

35. Having found that the reduced-form estimation is inconsistent with the investment-deterrence hypothesis and consistent with the competitive-stimulus hypothesis, I turn now to a more detailed empirical investigation of the competitive-stimulus hypothesis. The competitive-stimulus hypothesis does not merely predict the negative relationship between UNE pricing and ILEC investment confirmed in the previous section. That prediction is based on further empirically testable predictions that the level of CLEC competition will be negatively related to UNE pricing and that the level of ILEC investment will be positively related to the level of CLEC competitive activity. Thus, according to the full economic structure of the competitive-stimulus hypothesis, it is the combination of these two effects that gives rise to the overall negative relationship observed between ILEC investment and UNE pricing.

36. In order empirically to investigate these two effects, I employ a specification that looks beyond the summary relationships embodied in the reduced-form model of Section II. This specification involves a system of two equations. The first,

$$\begin{pmatrix} ILEC \\ Investment \end{pmatrix} = f\begin{pmatrix} Demand \\ Factors \end{pmatrix}, \begin{matrix} Current \\ Revenue \end{matrix}, \begin{matrix} ILEC\ Cost\ of \\ Investment \end{matrix}, \begin{matrix} Regulatory \\ Regime \end{matrix}, \begin{matrix} CLEC \\ Activity \end{matrix},$$

posits that ILEC investment is a function of demand factors, current revenue, the cost of investment to ILEC firms, the form of the regulatory regime, and the level of competitive activity by CLEC firms. This equation reflects direct determinants of the ILEC firms' behavior.

37. The second equation reflects the determinants of the behavior of CLEC firms. It takes the form

$$\begin{pmatrix} CLEC \\ Activity \end{pmatrix} = g\begin{pmatrix} Demand \\ Factors \end{pmatrix}, \begin{matrix} Current \\ Revenue \end{matrix}, \begin{matrix} CLEC\ Cost\ of \\ Participat\ ion \end{matrix}.$$

In this equation the cost of participation to a CLEC firm is measured by the UNE prices.

38. Taken together these two equations form a system that determines two endogenous variables, ILEC investment and CLEC activity as functions of the exogenous variables. In this

system, support for the competitive-stimulus hypothesis would take the form of a finding that the CLEC cost of participation is negatively related to CLEC activity in the second equation and that the level of ILEC investment is positively related to the level of CLEC activity in the first.

B. Data

39. With the exception of the dependent variable used in the second equation, the data used in this analysis are the same as described previously. The new variable is a measure of the level of CLEC activity.

40. To measure the extent of CLEC activity, I originally used the number of CLECs that were registered or licensed to operate in each state as of June, 2001. These data are available for each state from the Federal Communications Commission.[16] The natural logarithm of the number of CLEC firms in each state was used instead of the absolute number of firms. In the results, this variable is identified as the *Log of Number of CLECs.*

41. In addition to considering this variable, I also introduce as an alternative measure of CLEC activity the share of zip codes in each state that are served by one or more CLECs as of June, 2001, as reported to the FCC.[17] This variable is identified in the results as the *Share of Zip Codes w/ CLEC.*

42. I investigated the possibility of using data on the number of CLEC lines served by state, but I was unable to obtain a data source that was consistent with my other sources of data and that was reasonably complete. Because of changes in the FCC's reporting requirements and because of the fact that the FCC withholds data for states where competition is so limited that reporting the number of lines would be deemed to reveal competitively sensitive information, the data on CLEC lines by state did not provide a useful measure of CLEC activity.

C. Estimation

43. The results of estimating these systems are shown in Exhibits 2 and 3. Exhibit 2 shows the results using the number of CLEC firms as the measure of CLEC activity and Exhibit 3 shows the results using the share of zip codes with active CLECs as the measure of CLEC activity.[18] As in Exhibit 1, the model is estimated once using a variable that measures ILEC

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[16] See Table 8 of *Local Telephone Competition: Status as of June 30, 2001*, Industry Analysis Division, Common Carrier Bureau, Federal Communications Commission, February 2002.

[17] See Table 13 of *Local Telephone Competition: Status as of June 30, 2001*, Industry Analysis Division, Common Carrier Bureau, Federal Communications Commission, February 2002. Percentage with one or more is computed as one minus the percentage with zero.

[18] The regressions in Exhibits 2 and 3 are estimated using ordinary least squares (OLS). In this case the use of OLS for a system does not lead to a simultaneous equations bias because the two equations being estimated here form a recursive system. That is, the level of CLEC activity appears as a variable in the ILEC investment equation but the ILEC investment variable does not appear in the CLEC activity equation. See G.S. Maddala, *Econometrics* (McGraw-Hill, 1977), at 250 and Robert S. Pindyck and Daniel L. Rubinfeld, *Econometric Models and Economic Forecasts*, 3rd Ed. (McGraw-Hill, 1991) at 298.

investment from 1996 through 2000, with results shown in column two, and once using a variable that measures ILEC investment from 1996 through 2001, with results shown in column three. The results of estimating the CLEC activity equation are shown in column four.

44. Turning to Exhibit 2, the ILEC investment equations account for more than 75% of the variation in ILEC investment in both cases and over 65% on an adjusted basis. Since CLEC activity is measured somewhat imperfectly, that is, because two different proxy measures are being tested, it is not surprising that the CLEC equation accounts for a smaller share of the variation. Still, the CLEC equation is statistically significant at a very high level. The statistically significant coefficients in the ILEC equations show that ILEC investment is positively related to population growth and telephone prices and negatively related to the cost of investment in telephone infrastructure (i.e., the TELRIC levels).

45. Exhibit 2 confirms the mechanism of the competitive-stimulus hypothesis in both essential respects. First, in both column 2 and column 3 the coefficient on the number of CLEC firms in the ILEC investment equation is positive and statistically significant at the 96% level in one case and at the 98% level in the other. Second, in the CLEC equation the estimated coefficient on the UNE price is negative and statistically significant at the 99% level.[19]

46. The results in Exhibit 3 provide further support for the mechanism of the competitive-stimulus hypothesis by demonstrating that the results are robust to the use of the alternative proxy measure of CLEC activity, in this case the share of zip codes with one or more active CLEC firms. As with the results in Exhibit 2, both variations on the ILEC investment equation account for a large share of the variation in ILEC investment and both equations are statistically significant at a very high level. In both cases, ILEC investment responds positively to telephone prices and negatively to the cost of network infrastructure. In both cases, the effect of increased CLEC activity is positively related to ILEC investment. When the latter is measured from 1996 through 2000 that effect is statistically significant at the 97% level, and when the latter is measured from 1996 through 2001 that effect is statistically significant at the 94% level. While the CLEC equation does not account for a particularly high share of variation in the CLEC zip code variable, the equation as a whole is statistically significant at more than 95% confidence and exhibits a statistically significant negative relationship between the level of CLEC activity, measured in this way, and the level of UNE pricing.

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[19] The regressions reported in Exhibit 2 are based on samples of 46 observations. The observation for Michigan and Delaware are both missing, Michigan because no unemployment data are available (see note 10) and Delaware because the FCC data on the number CLECs identifies 0 CLECs in Delaware. Since one cannot take the logarithm of zero, there is no value for this variable for Delaware. I understand, however, that there is a CLEC, [Cavalier Telephone Company] operating in Delaware that is not reflected in the FCC data. [www.cavtel.com] I have tested my results for robustness with respect to both of these omissions. As with the reduced form model (see footnote 15) when I add an approximate value for Michigan there is no substantive change in the results. Likewise, when I include Delaware in the sample with the data corrected to reflect the missing CLEC in Delaware, there is no substantive change in the results.

IV. Conclusion

47. The analysis presented here provides strong empirical support for refuting the investment-deterrence hypothesis that regulatory mandated unbundling reduces incentives for ILEC investment. Instead, the available data support the contrary *competitive-stimulus* hypothesis that posits that regulatory unbundling facilitates CLEC competition, which in turn increases ILEC incentives to invest. This means that policy makers need not confront the trade-off implied by the investment-deterrence hypothesis. For under the investment-deterrence hypothesis the social gain from greater competition brought about by competitive access to unbundled network elements has to be balanced against the disincentive to investment allegedly created by the same mechanism. Confirmation of the competitive-stimulus hypothesis should reassure policy makers that the benefits of competition do not come at the expense of investment. Rather, the competition enhancing effect of unbundled network access also promotes greater investment.

48. The results presented here are substantially the same as those reported in my Initial Declaration, but the use of additional and improved data offers yet stronger support and confirmation.

EXHIBIT 1
Reduced Form Regressions

Description	Regression Results	Regression Results
Dependent Variable	Investment to 2000	Investment to 2001
*Independent Variables**		
1996 Plant in Service	0.0057	0.0425
	(0.890)	(0.419)
Labor Force Share in FIRE	828.3315	899.0358
	(0.028)	(0.059)
Population Growth	173.6273	226.8132
	(0.000)	(0.000)
Average Unemployment	-3.6339	-10.3304
	(0.467)	(0.111)
Average Revenue	4.7494	6.6225
	(0.005)	(0.003)
Zone 1 UNE Price	-2.7628	-3.9071
	(0.011)	(0.005)
TSR Discount	85.0554	55.7267
	(0.493)	(0.724)
TELRIC	-3.2538	-4.1276
	(0.005)	(0.006)
Price Cap Regulation	8.5180	-3.1070
	(0.592)	(0.878)
Price Cap/Interim Rate Freeze	12.6439	1.3444
	(0.441)	(0.949)
Rate Freeze Non-Indexed Cap	10.2213	5.8072
	(0.584)	(0.807)
Deregulation	-136.9659	-193.5255
	(0.000)	(0.000)
Constant	-93.7193	-75.1956
	(0.142)	(0.352)
Summary Statistics		
R^2	0.7727	0.7730
Adjusted R^2	0.6924	0.6929
P-Value	0.0000	0.0000

* Values reported are estimated coefficients with probability values in parentheses beneath.

EXHIBIT 2
Structural Regressions Using Number of CLECs

Description	Regression Results	Regression Results	Regression Results
Dependent Variable	Investment to 2000	Investment to 2001	Log of Number of CLECs
*Independent Variables**			
1996 Plant in Service	0.0276	0.0713	
	(0.510)	(0.206)	
Log of Number of CLECs	18.8408	20.5623	
	(0.012)	(0.037)	
Labor Force Share in FIRE	580.0321	537.1570	12.1646
	(0.208)	(0.380)	(0.129)
Population Growth	145.7465	200.1888	0.7718
	(0.002)	(0.001)	(0.457)
Average Unemployment	-3.2208	-9.3215	0.0268
	(0.521)	(0.169)	(0.813)
Average Revenue	3.1938	4.3023	-0.0148
	(0.033)	(0.031)	(0.667)
TELRIC	-3.0351	-4.2664	
	(0.020)	(0.015)	
UNE Price			-0.0651
			(0.005)
TSR Discount			5.0942
			(0.091)
Price Cap Regulation	10.7653	1.7870	
	(0.492)	(0.932)	
Price Cap/Interim Rate Freeze	15.1499	7.9534	
	(0.347)	(0.710)	
Rate Freeze Non-Indexed Cap	10.5574	4.0174	
	(0.571)	(0.871)	
Deregulation	-114.3483	-163.3171	
	(0.001)	(0.001)	
Constant	-114.2408	-96.6967	1.2564
	(0.081)	(0.263)	(0.374)
Summary Statistics			
R^2	0.7637	0.7438	0.4599
Adjusted R^2	0.6872	0.6610	0.3768
P-Value	0.0000	0.0000	0.0003

* Values reported are estimated coefficients with probability values in parentheses beneath.

EXHIBIT 3
Structural Regressions Using Zip Code Coverage

Description	Regression Results	Regression Results	Regression Results
Dependent Variable	Investment to 2000	Investment to 2001	Share of Zip Codes w/ CLEC
*Independent Variables**			
1996 Plant in Service	-0.0184	0.0208	
	(0.677)	(0.722)	
Share of Zip Codes w/ CLEC	36.3356	38.9008	
	(0.021)	(0.060)	
Labor Force Share in FIRE	839.2693	857.7838	1.1145
	(0.028)	(0.087)	(0.689)
Population Growth	148.8528	202.7094	0.6427
	(0.001)	(0.001)	(0.133)
Average Unemployment	-2.8676	-8.8375	0.0284
	(0.567)	(0.189)	(0.552)
Average Revenue	3.3015	4.3609	0.0050
	(0.027)	(0.028)	(0.720)
TELRIC	-3.8339	-5.0796	
	(0.001)	(0.001)	
UNE Price			-0.0196
			(0.033)
TSR Disount			2.7056
			(0.035)
Price Cap Regulation	16.4501	8.2745	
	(0.282)	(0.682)	
Price Cap/Interim Rate Freeze	20.7308	14.2341	
	(0.186)	(0.491)	
Rate Freeze Non-Indexed Cap	-0.6175	-8.3251	
	(0.974)	(0.739)	
Deregulation	-116.9780	-165.7673	
	(0.001)	(0.001)	
Constant	-91.7973	-74.4393	-0.0242
	(0.124)	(0.344)	(0.967)
Summary Statistics			
R^2	0.7603	0.7406	0.282
Adjusted R^2	0.6850	0.6591	0.1743
P-Value	0.0000	0.0000	0.031

* Values reported are estimated coefficients with probability values in parentheses beneath.